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OPERATION HARDTACK.

Volume II.

Radiological Safety. *Final Report*

Final Report

ADA 085318

DTIC

JUN 10 1980

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) HARDTACK RADSAFE Fallout Hodograph RADSAFE Survey		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This is the final report of the RADSAFE operation during the HARDTACK Series of nuclear tests in the Pacific. Forecast and actual fallout is presented.		

VOLUME II

INDEX

<u>EVENT</u>	<u>PAGE</u>
REDWOOD	3
ELDER	14
OAK	25
HICKORY	37
SEQUOIA	48
CEDAR	58
DOGWOOD	69
POPLAR	81
SCAEVOLA	93
PISONIA	99
JUNIPER	111
OLIVE	122
PINE	133
TEAK	145
QUINCE	146
ORANGE	153
FIG	154

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FOREWORD

This report has had classified material removed in order to make the information available on an unclassified, open publication basis, to any interested parties. This effort to declassify this report has been accomplished specifically to support the Department of Defense Nuclear Test Personnel Review (NTPR) Program. The objective is to facilitate studies of the low levels of radiation received by some individuals during the atmospheric nuclear test program by making as much information as possible available to all interested parties.

The material which has been deleted is all currently classified as Restricted Data or Formerly Restricted Data under the provision of the Atomic Energy Act of 1954, (as amended) or is National Security Information.

This report has been reproduced directly from available copies of the original material. The locations from which material has been deleted is generally obvious by the spacings and "holes" in the text. Thus the context of the material deleted is identified to assist the reader in the determination of whether the deleted information is germane to his study.

It is the belief of the individuals who have participated in preparing this report by deleting the classified material and of the Defense Nuclear Agency that the report accurately portrays the contents of the original and that the deleted material is of little or no significance to studies into the amounts or types of radiation received by any individuals during the atmospheric nuclear test program.

VOLUME II

INDEX

<u>EVENT</u>	<u>TAB</u>
REDWOOD	19
ELDER	20
OAK	21
HICKORY	22
SEQUOIA	23
CEDAR	24
DOGWOOD	25
POPLAR	26
SCAEVOLA	27
PISONIA	28
JUNIPER	29
OLIVE	30
PINE	31
TEAK	32
QUINCE	33
ORANGE	34
FIG	35

INDEX

TAB

A--Summary, REDWOOD Event, Operation HARDTACK

B--Forecast Fallout Plot

C--Trajectory Plot

D--Surface and Air Radex

E--1. Forecast Hodegraph

2. Shot-time Hodegraph

3. Weather Summary

F--Radiological Surface Survey, H+2 Hours

REDWOOD EVENT
OPERATION HARDTACK

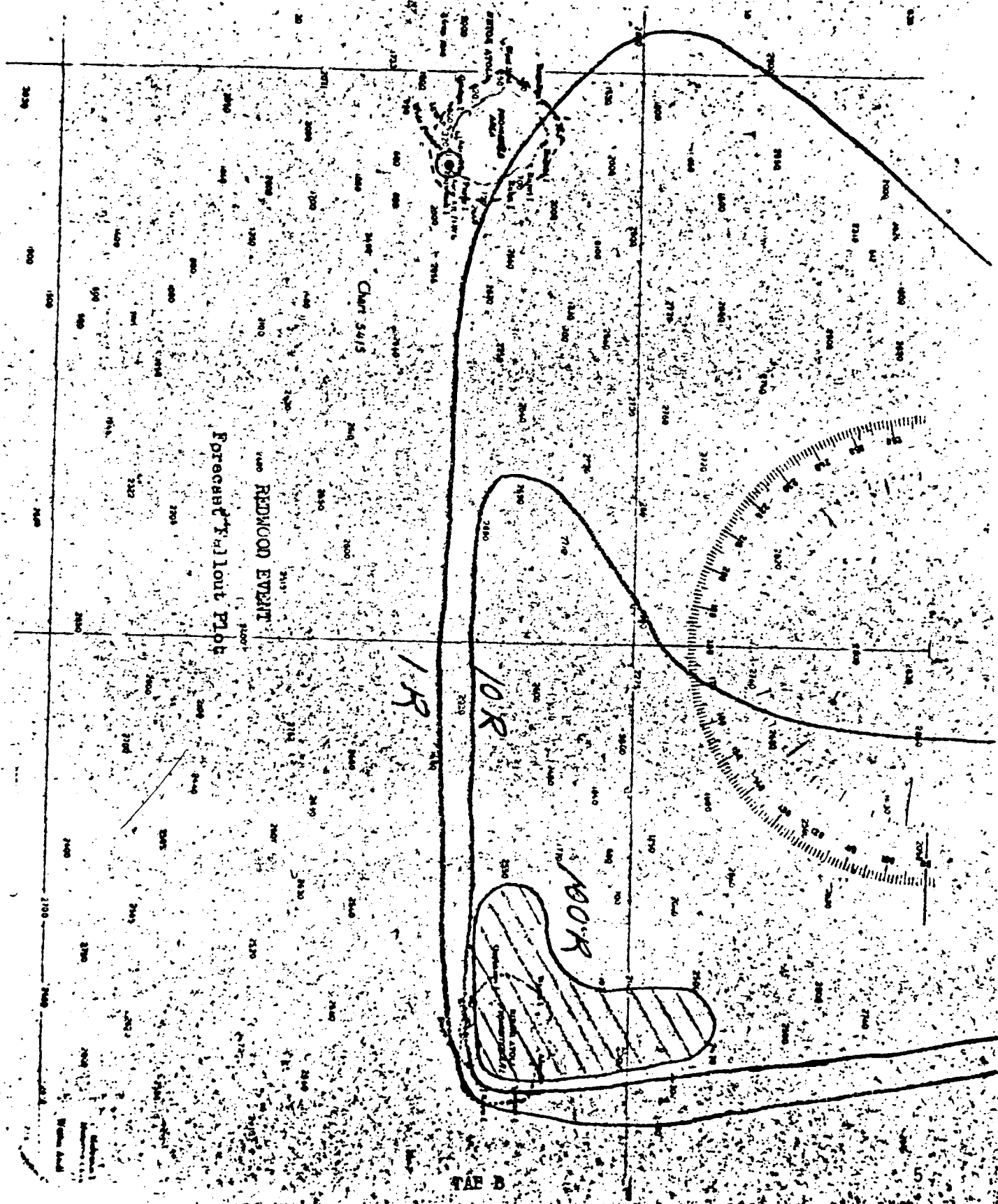
1. The REDWOOD device was detonated on a barge north of Fox Island, Bikini Atoll, at 0520M, 28 June 1958. RadSafe operations were controlled through the USS Banner, located in the Bikini Lagoon. [REDACTED]

[REDACTED] The cloud rose immediately to 51,000 feet, and it was reported stabilized at 55,000 feet by the E-52 at 0610M; the base was estimated at 28,000 feet.

2. The cloud moved out of the lagoon area rapidly, and at 0600M the P2V (Wildroot #13) commenced his radiological survey at 1,000 feet. Only background was obtained with the exception of the area adjacent to ground zero. Dog Island read 25 mr/hr, and George Island read 47 r/hr at 0630M.

3. The helicopter commenced the survey at 0650M, and re-entry hour was declared at 0700M. The only significant readings were obtained near the ground zero. They were: Charlie Island, 500-600 mr/hr at 100 feet; the crater, 5 r/hr at 100 feet at 0720M.

4. The P2V was then vectored on radials of 260 degrees, 270 degrees, and 090 degrees from Bikini for 100 miles as a barrier patrol. The fallout pattern was forecast on mean bearings of 270 degrees and 360 degrees. The P2V found no fallout north and east of this predicted area, and it was released at 1100M.



Forecast Flight Plot

REDWOOD EVENT

Chart 5415

1R

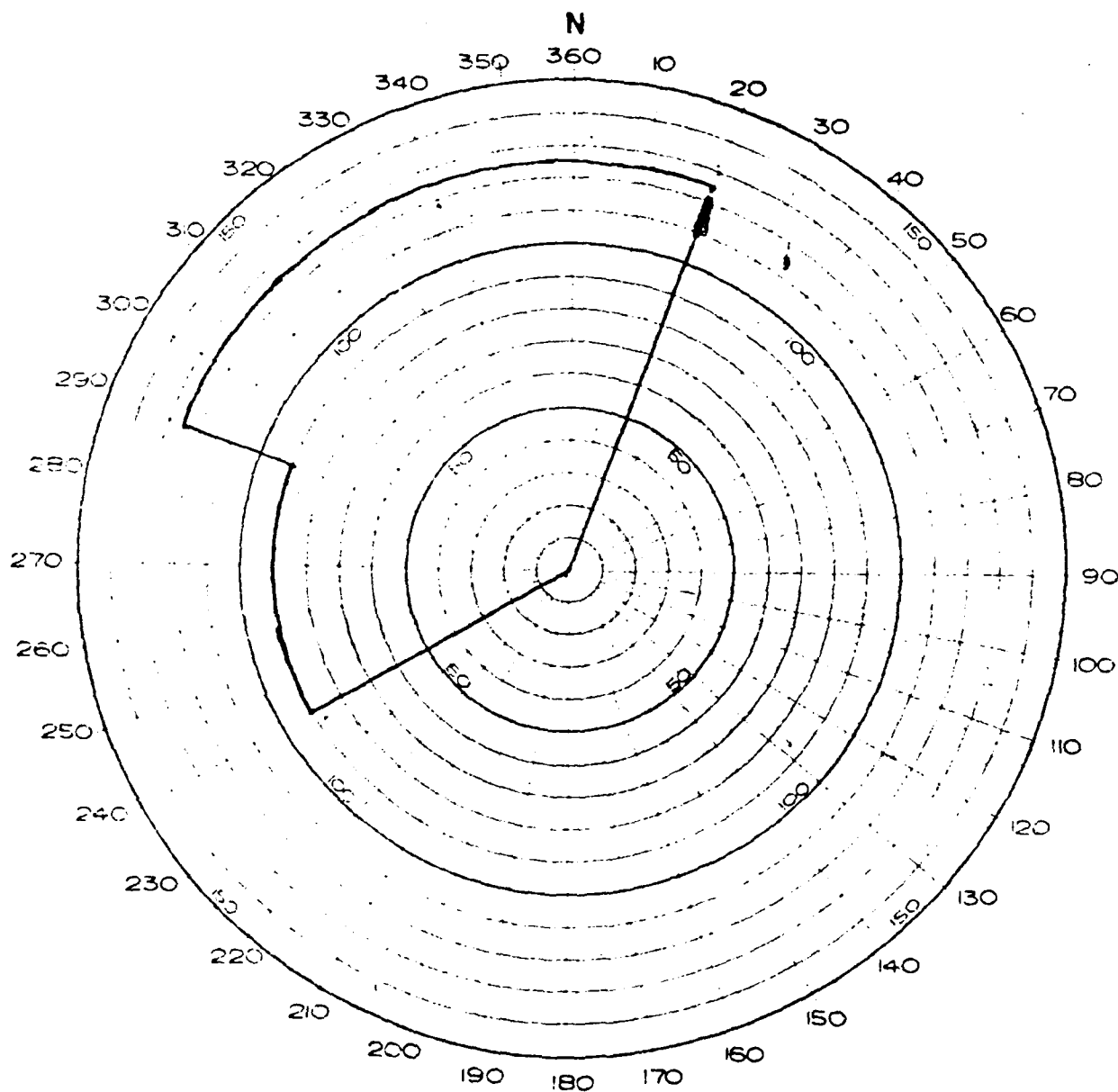
10R

100R

TAN B

HODOGRAPH

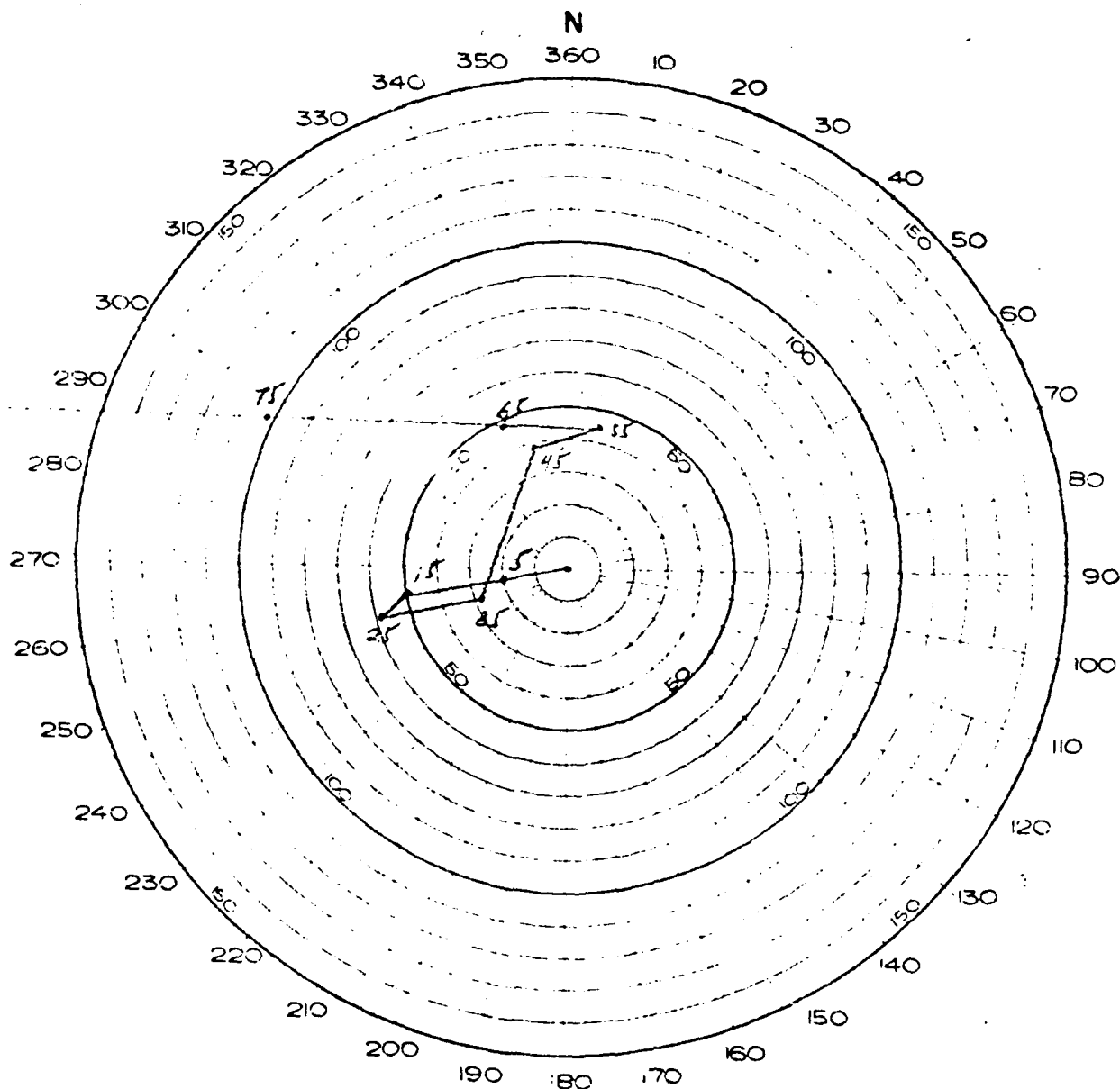
RESULTANT WINDS AND SURFACE RADEX



REMARKS EVENT
Surface and Air Index

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



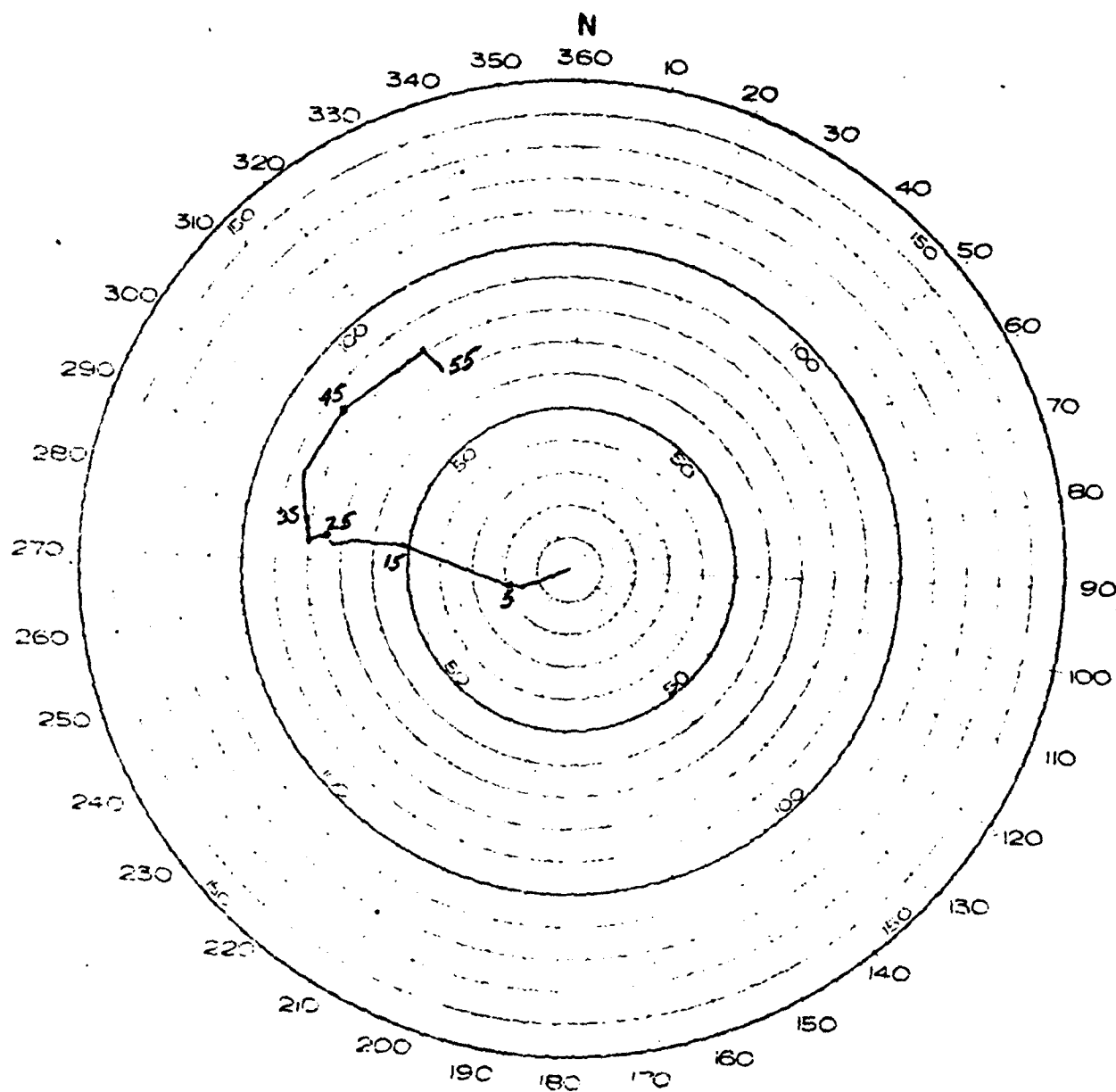
125/100 12/11

125/100 12/11

125/100 12/11

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



RELWOD EVENT

Shot-time Hodograph

TAP 1-2

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

29 JUNE 1958

REDWOOD

BIKINI OBSERVED WEATHER FOR 28 JUNE 1958

SURFACE WEATHER:

Sea Level Pressure	1010.1 mbs
Free Air Surface Temperature	81.2 °F
Wet Bulb Temperature	79.2 °F
Dew Point Temperature	78.5 °F
Relative Humidity	92%
Surface Wind	065° 10 knots
Visibility	10 miles
Weather	None

CLOUDS:

Broken (6/10) cumulus, bases unknown

AIR WEATHER SUMMARY FROM AIRCRAFT:

Scattered (5/10) cumulus, bases unknown. Broken (7/10-8/10) cirrus, bases 35,000 feet, tops 40,000 feet.

STATE OF THE SEA:

Open Sea; Waves 4-5 feet high, period 4-5 seconds, length 50-75 feet.

Lagoon Side: Waves less than 1 foot, period 2-3 seconds.

REDWOOD

BIMINI RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1008	Surface	28.2	24.8
1000	250	28.2	23.5
919	2,657	20.8	18.2
850	4,800	17.2	12.2
807	6,365	14.5	08.2
778	7,415	15.8	01.5
760	8,030	13.2	05.2
740	8,760	12.2	-02.5
712	9,810	10.2	-00.5
700	10,260	09.8	-07.2
696	10,433	09.8	-12.2
652	12,205	08.0	Miss
600	14,410	02.5	Miss
566	15,978	-01.0	Miss
500	19,170	-05.5	Miss
400	24,820	-15.2	Miss
300	31,172 720	-29.8	Miss
250	35,880	-40.0	Miss
200	40,750	-52.8	Miss
150	46,610	-68.2	Miss
112	52,100	-79.0	Miss
100	54,330	-79.0	Miss
091	56,069	-72.0	Miss
058	64,731	-65.0	Miss
050	67,860	-63.0	Miss
030	78,340	-56.0	Miss
025	82,120	-57.2	Miss
010	87,868	-43.0	Miss

REDWOOD

BIMINI WINDS ALFT OBSERVATION

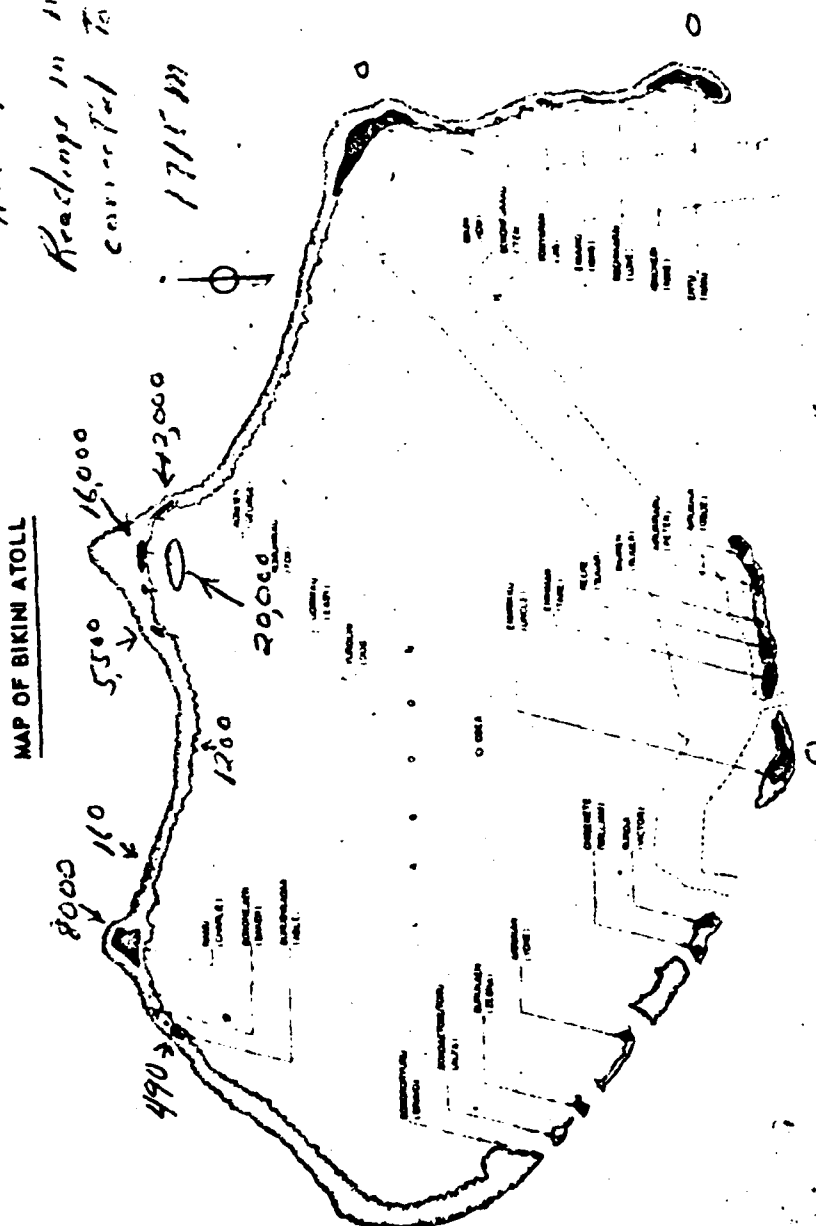
Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	060 070	20
1,000	070	20
2,000	070	22
3,000	070	22 20
4,000	070	17
5,000	080	16
6,000	100	18
7,000	100	19
8,000	110	19
9,000	110	20
10,000	110	20
12,000	110	18
14,000	110	17
16,000	100	16
18,000	090	14
20,000	100	16
22,000	150	12
24,000	100	10
26,000	160	10
28,000	130	07
30,000	070	05
32,000	030	03
34,000	200	04
36,000	100	02
38,000	170	06
40,000	170	14
42,500	210	17
45,000	210	22
47,500	200	14
50,000	230	21 21
52,500	310	13
55,000	310	06
57,500	010	04
60,000	130	07

Whisper Sweet

Readings in inches
corrected to ground

111-111

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RECEIVED

INDEX

TAB

A--Summary, ELDER Event, Operation HARETACK

B--Forecast Fallout Plot

C--Trajectory Plot

D--Surface and Air Radar

E--1. Forecast Hodograph

2. Shot-time Hodograph

3. Weather Summary

F--Radiological Surface Survey, H-7 Hours

ELDER EVENT
OPERATION HARDTACK

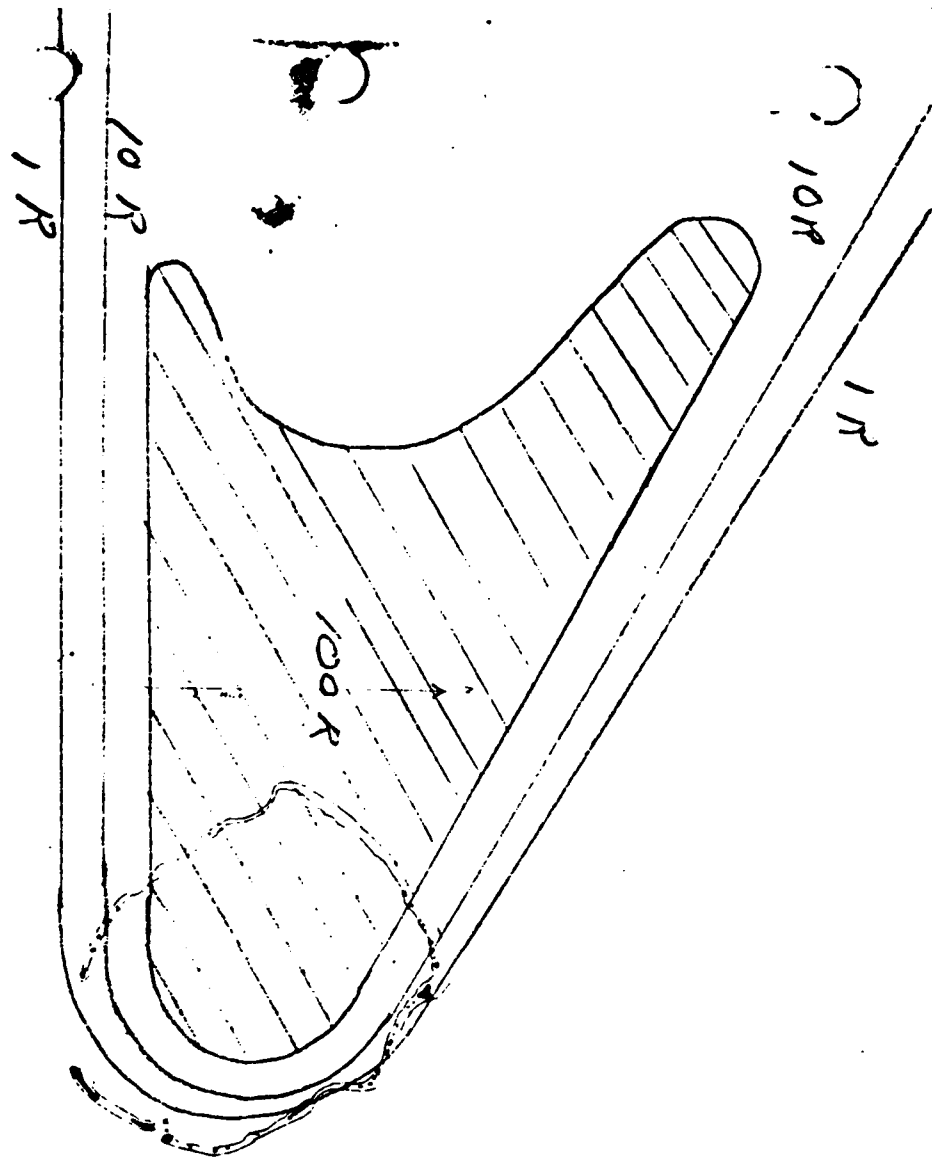
1. ELDER was detonated at 0630M on a barge one mile southwest of Janet Island, Eniwetok Atoll, on 28 June 1958. The cloud rose more rapidly than usual and passed beyond the upper limit of the weather radar (50,000 feet) at H+2 minutes and 50 seconds. No cloud height observations from aircraft were readily available, and it was not until H+50 minutes that a cloud sampler reported the top at 58,000 feet. This figure would indicate that the initial cloud height was probably well over 65,000 feet.

2. Cloud movement was generally to the north, with stem movement to the west-northwest. Net movement was slow; in fact, the upper cloud (above 50,000 feet) could be observed directly over the atoll for several hours.

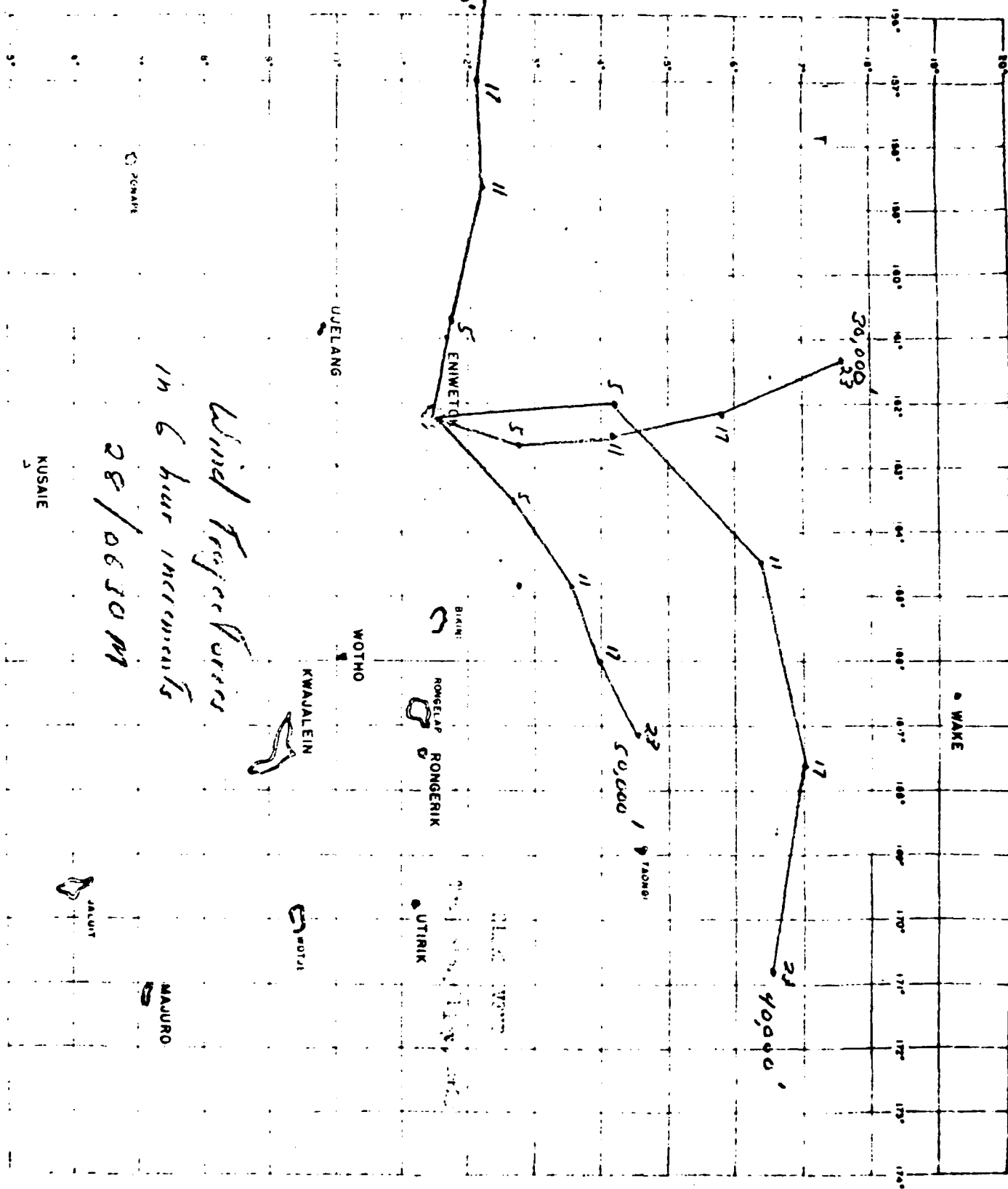
3. The P2V arrived at H+30 minutes and cleared the lagoon south of a line from Yvonne to Leroy by H+1. The rest of the lagoon was cleared by H+2½ except for the islands from Alice to Wilma, and re-entry hour was declared by H+3.

4. FOFU predicted a fallout plot between the radial 270 degrees to 320 degrees. The actual pattern was from 260 degrees to 010 degrees, with the extent essentially as predicted.

TAB A

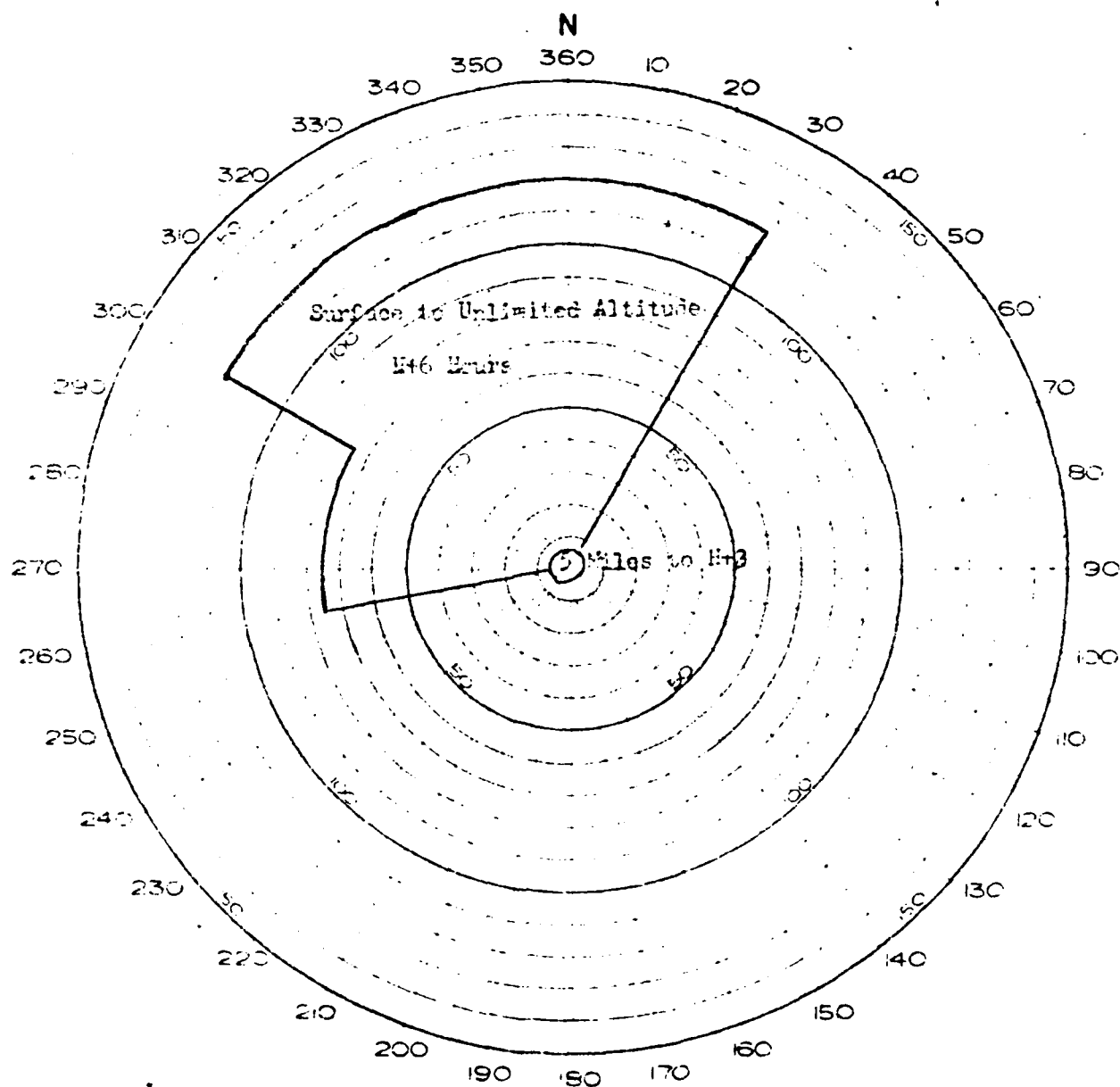


1000 ft. x 100 ft. plot



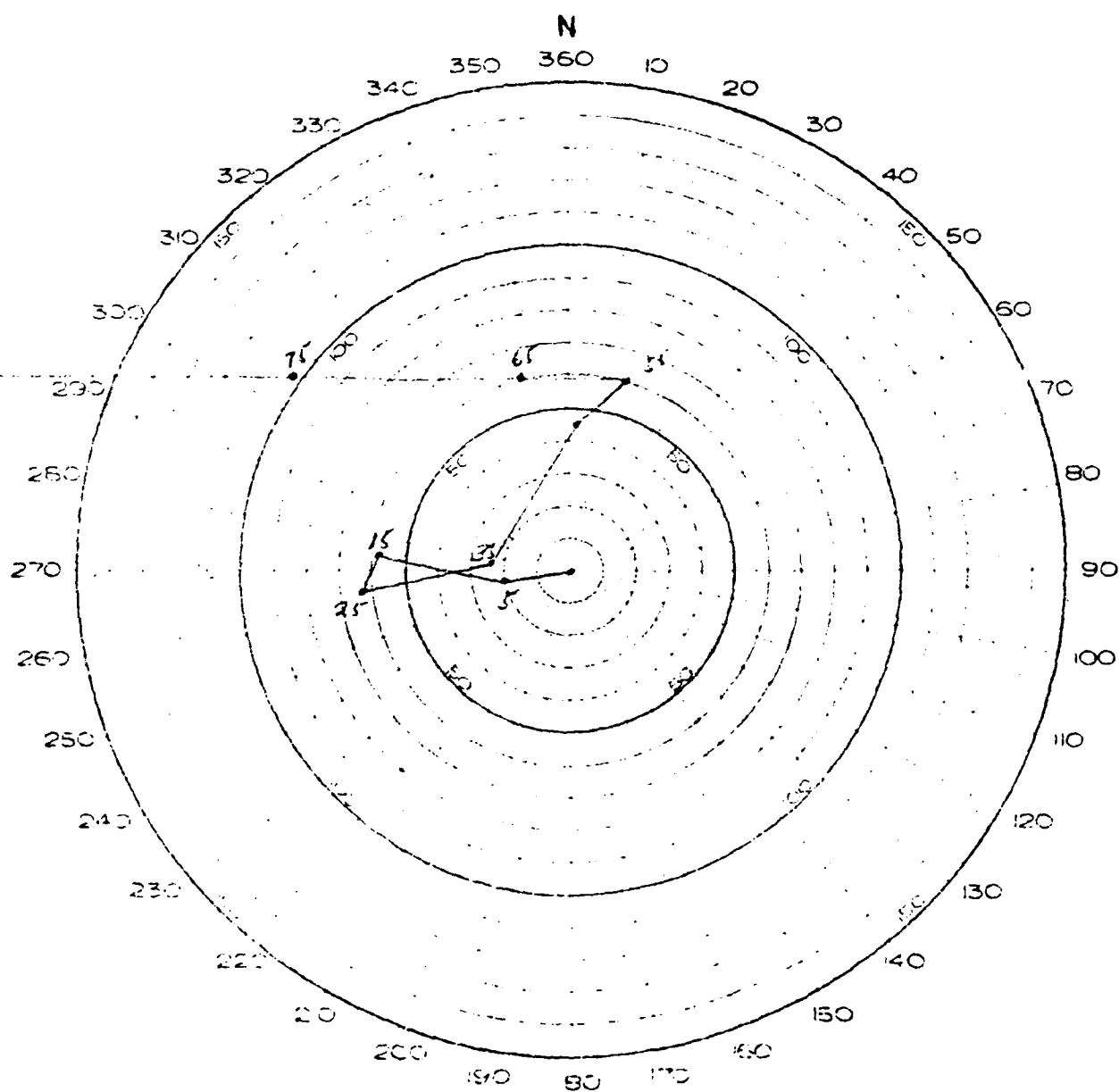
HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



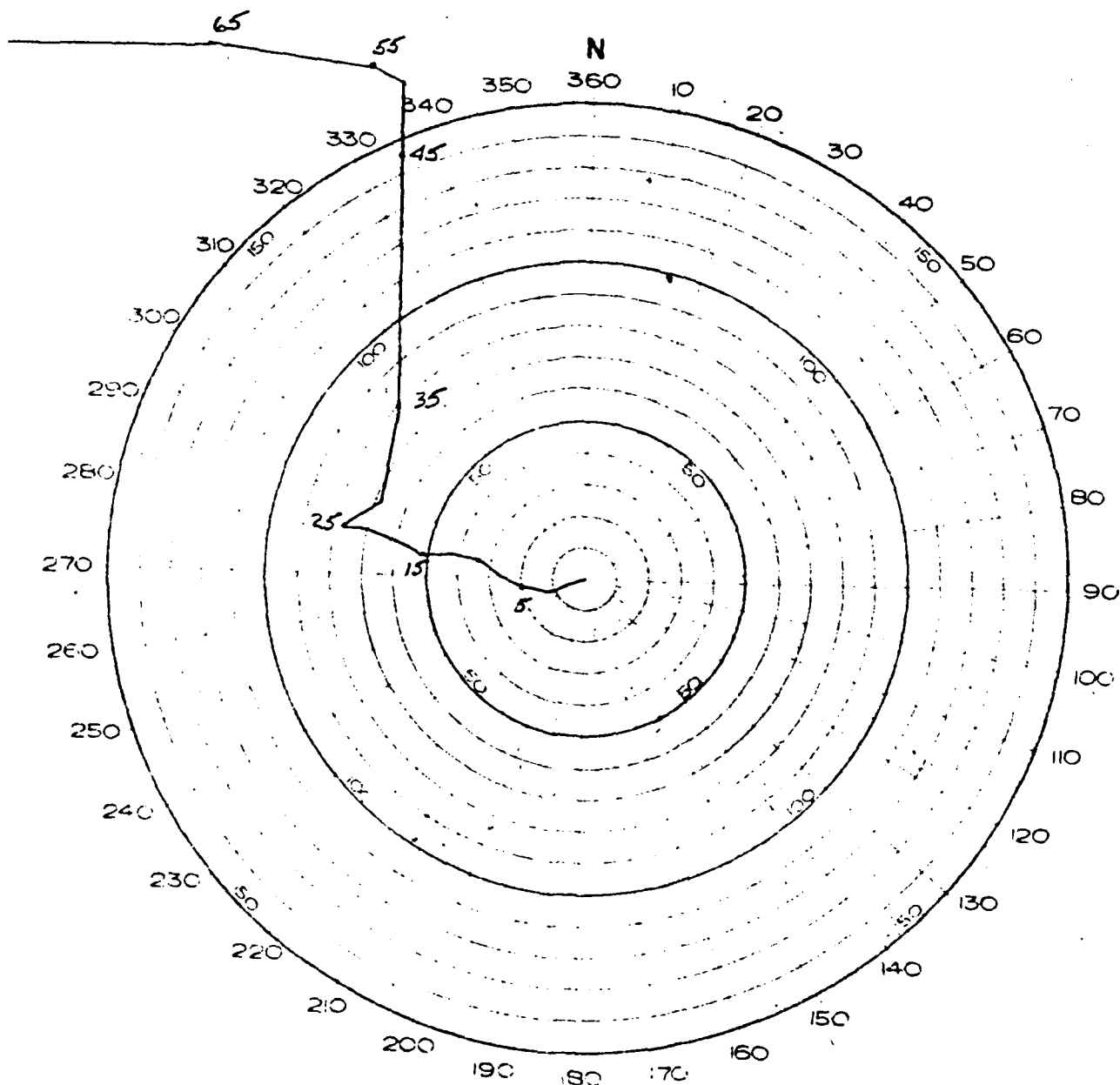
LINE VIEW

Forecast Hodograph

Fig. 1-1

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



ELDER STATE

Shoreline, Michigan
280030Z June

7.0 2.0

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

28 June 1958

ELDER
ENHINGTON OBSERVED WEATHER FOR 28 JUNE 1958

SURFACE WEATHER:

Sea Level Pressure	1008.7 mbs
Free Air Surface Temperature	81.3° F
Wet Bulb Temperature	80.0° F
Dew Point Temperature	74.0° F
Relative Humidity	78%
Surface Wind	090° 17 knots
Visibility	10 miles
Weather	None

CLOUDS:

Scattered (2/10) cumulus, bases 1800 feet. Thin overcast
(10/10) cirrostratus, bases unknown.

AREA WEATHER SUMMARY FROM AIRCRAFT

Scattered (2/10-4/10) cumulus, bases 1,800 feet. Scattered to
broken (5/10-9/10) cirriform, bases 35,000 feet, tops 40,000 feet.

STATE OF THE SEA:

Open Sea: Waves 5 feet high, period 5 seconds, length 80 feet.
Lagoon side: Waves less than 1 foot high, period 1-2 seconds.

FLD R

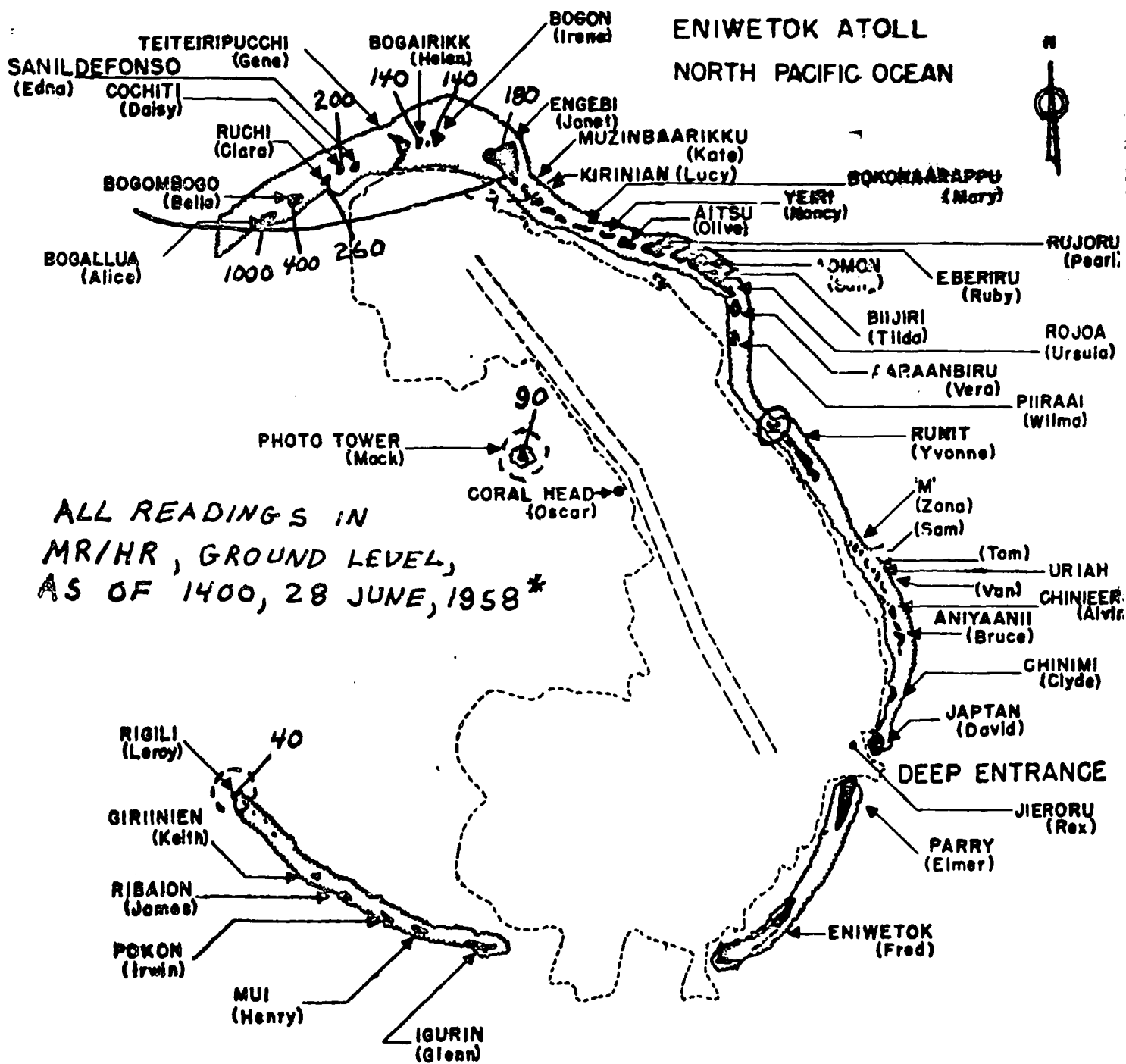
THURSDAY RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1008	Surface	28.2	24.8
1000	250	28.2	23.5
919	2,657	20.8	18.2
850	4,890	17.2	12.2
807	6,365	14.5	08.2
778	7,415	15.8	01.5
760	8,030	13.2	05.2
740	8,760	12.2	-02.5
712	9,810	10.2	-00.5
700	10,260	09.8	-07.2
696	10,433	08.8	-12.2
652	12,205	08.0	Miss
600	14,410	02.5	Miss
566	15,978	-01.0	Miss
500	19,170	-05.5	Miss
400	24,820	-15.2	Miss
300	31,720	-29.8	Miss
250	35,880	-40.0	Miss
200	40,750	-52.8	Miss
150	46,610	-68.2	Miss
112	52,100	-79.0	Miss
100	54,330	-76.0	Miss
091	56,069	-72.0	Miss
058	64,731	-65.0	Miss
050	67,860	-63.0	Miss
030	78,340	-56.0	Miss
025	82,120	-57.2	Miss
010	97,868	-43.0	Miss

ELMER

WINDTCK WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	090	20
1,000	070	23
2,000	070	23
3,000	080	21
4,000	090	19
5,000	090	19
6,000	100	17
7,000	110/20	20
8,000	130	18
9,000	130	19
10,000	110/20	17
12,000	090	17
14,000	090	16
16,000	110	14
18,000	120	11
20,000	110	14
22,000	120	12
24,000	090	13
26,000	090	12
28,000	150	08
30,000	230	14
32,000	230	23
34,000	210	26
36,000	190	31
38,000	190	37
40,000	180	41
42,500	180	40
45,000	180	39
47,500	230	24
50,000	180	20
52,500	190	08
55,000	120	11
57,500	120	06
60,000	100	23
65,000	100	24
70,000	060	40
75,000	100	41
80,000	000	53
85,000	000	67
90,000	000	81
95,000	000	78
97,000	090	78



INDEX

TAB

A--Summary, CAC Event, Operation HARDTACK

B--Forecast Fallout Plot

C--Trajectory Plot

D--Surface and Air Radex

E-1. Forecast Holograph

2. Shot-time Holograph

3. Weather Summary

F--Radiological Surface Survey, D+1 Day

OAK EVENT

OPERATION HARDTACK

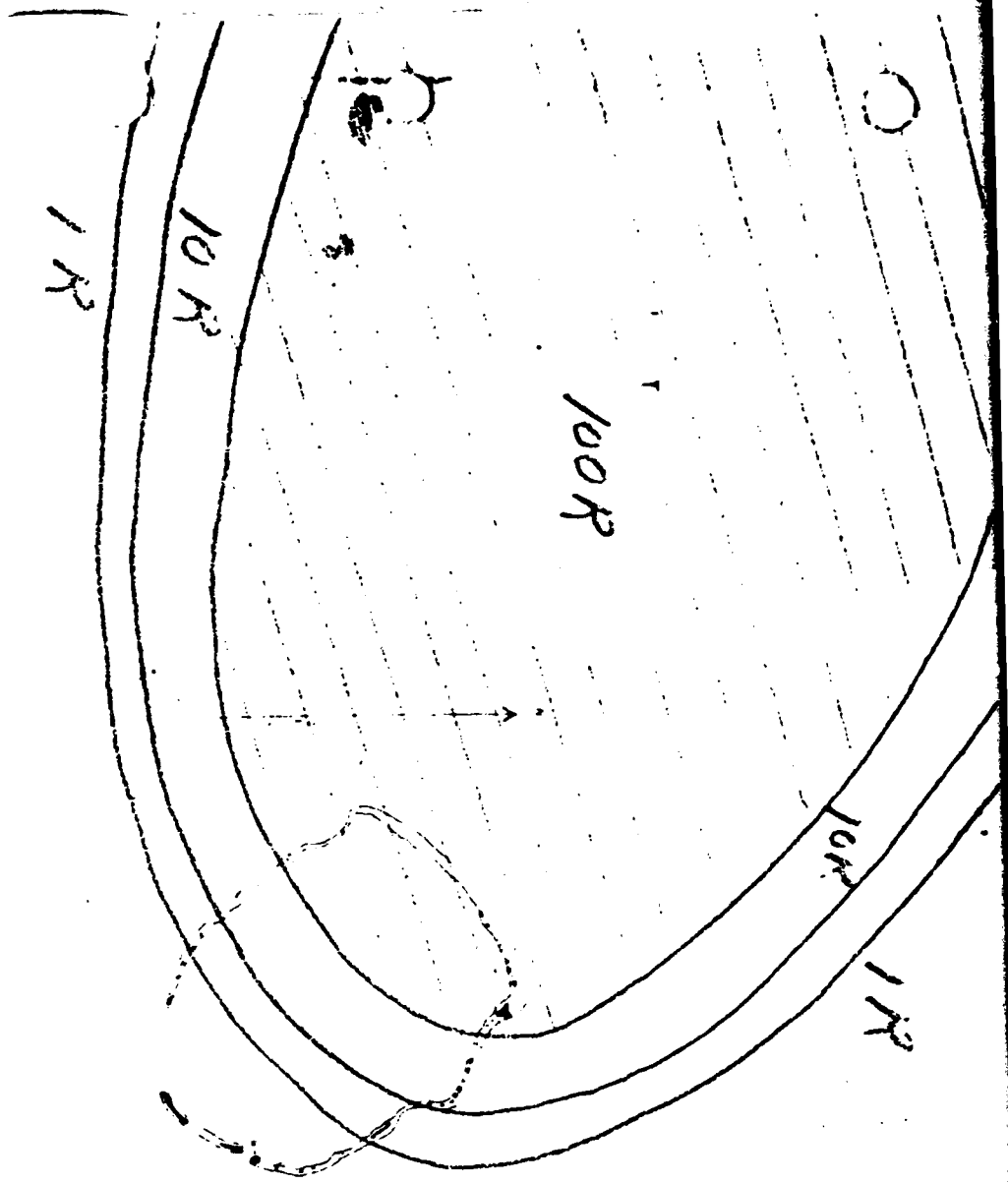
1. OAK was detonated on the reef nine miles north of Leroy Island, Eniwetok Atoll, at 0730M, 29 June 1958. The yield of 9 MT produced a cloud which pierced the tropopause at 55,000 feet in well under two minutes. 8.9m
No actual observations on the initial cloud height were made because no aircraft were in position; however, it is estimated that initial height was probably near 78,000 feet. The first reading was obtained at H+3 hours when a sampler aircraft reported the stabilized height of the cloud at 67,000 feet.

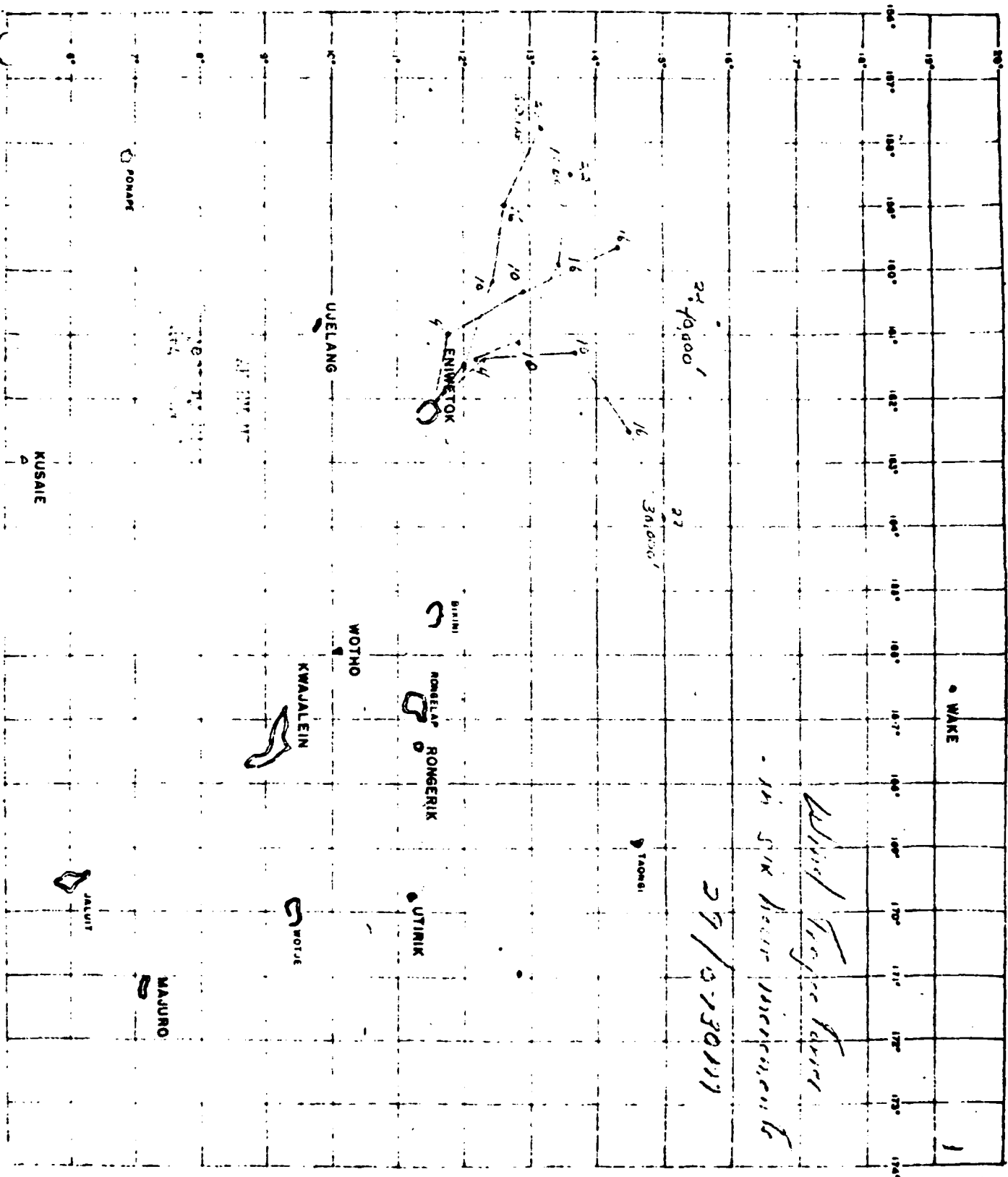
2. Initial movement of the lower portion (below 50,000 feet) was to the west, with a net velocity of slightly over fifteen knots. The lagoon was swept with more than usual caution due to the size of the detonation. Re-entry hour was declared at 1000M after a thorough P2V sweep at 1,000 feet. The atoll was free of contamination except for the islands Alice through Daisy (closest to ground zero), which averaged 35 mr.

3. The portion of the cloud at approximately 55,000 feet remained in the vicinity of ground zero for several hours, then moved slowly to the southwest. This cell was reported 60 miles southwest at nightfall with an intensity of 350 mr/hr measured by the sampler aircraft. This cloud was again detected early the next morning at 200 miles southwest of Fred and was measured at 40 mr/hr. No further information on this part of the cloud became available.

4. Helicopter surveys at H-3 and D+1 both confirmed the information obtained by the P2V lagoon survey.

5. The predicted fallout pattern was oriented between the radials 280 degrees and 320 degrees. The actual pattern was more westerly, with some contamination reported as far south as Ujelang. FOFU had predicted close-in values of 100 r for a six-mile radius and 10 r for a 12-mile radius upwind of ground zero, but the initial P2V survey indicated that this prediction was not borne out.



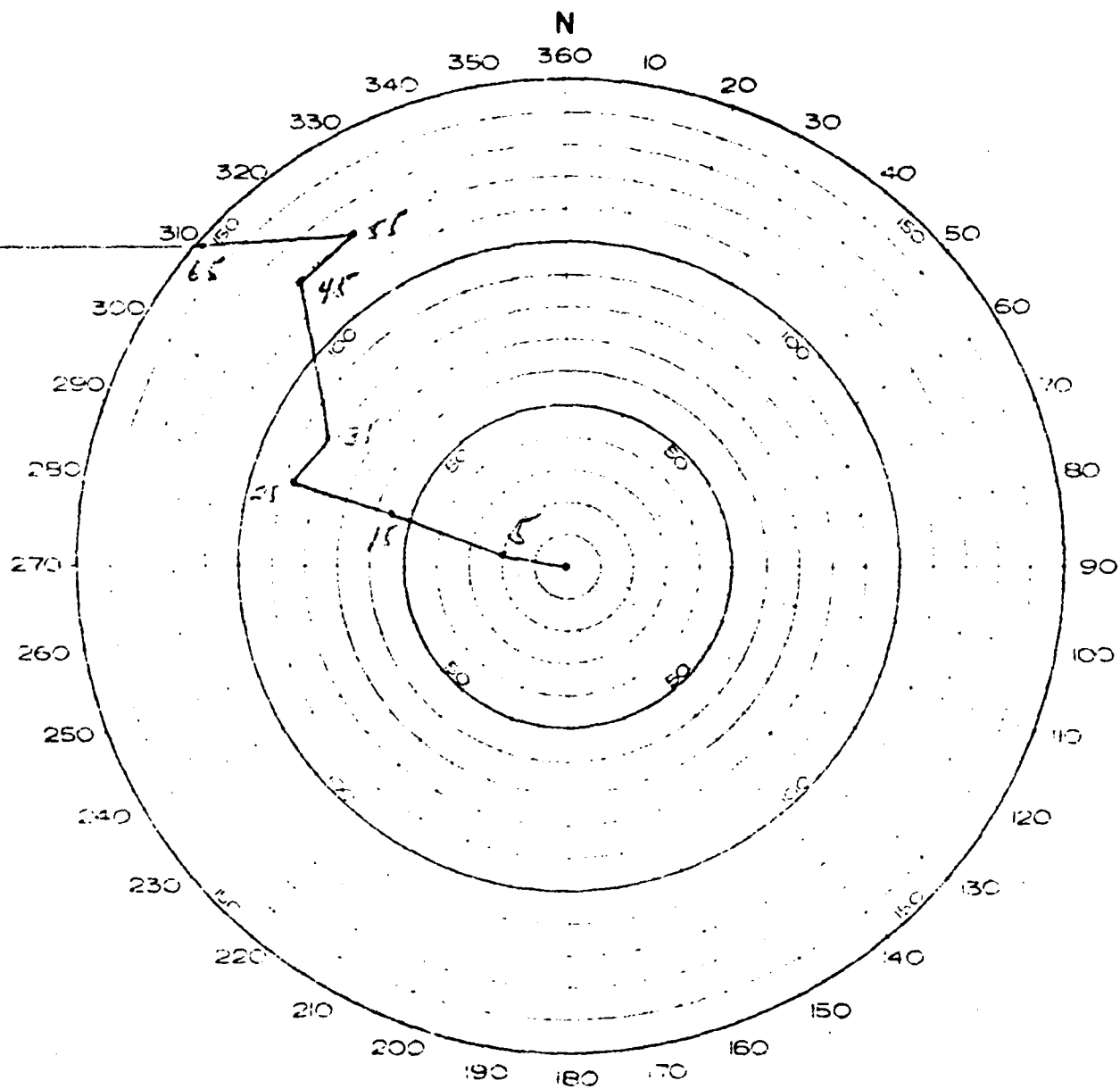


Admiral Togo's flight
in six hour increments

HODOGRAPH

RESULTANT WINDS AND

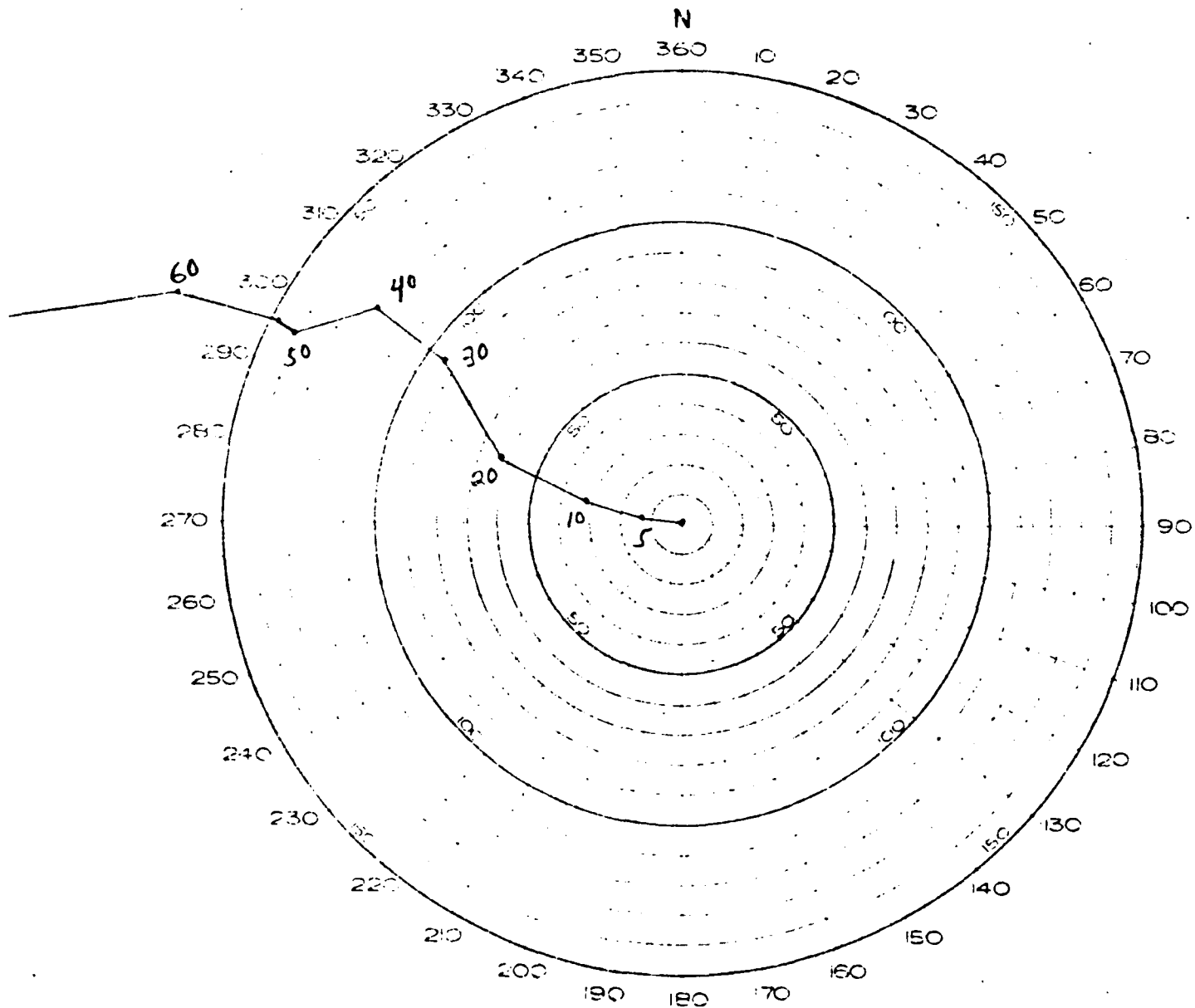
SURFACE RADEX



112 1-1

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



U.S. NAVY

Hodograph

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

30 JUNE 1958

CAK

ENIWETOK OBSERVED WEATHER FOR 29 JUNE 1958

SURFACE WEATHER:

Sea Level Pressure	1009.5 mbs
Free Air Surface Temperature	81.1° F
Wet Bulb Temperature	77.9° F
Dew Point Temperature	76.5° F
Relative Humidity	87%
Surface Wind	120° 14 knots
Visibility	10 miles
Weather	None

CLOUDS:

Scattered (5/10) cumulus, bases 2,000 feet. Scattered altostratus (3/10) bases 14,000 feet. Broken (8/10) cirriform, bases unknown. Towering cumulus West, distance unknown.

AIR WEATHER SUMMARY FROM AIRCRAFT:

Scattered (4/10-5/10) cumulus, bases 3,000 feet, tops 7,000 feet. Broken (8/10) thin cirriform, bases 22,000 feet. Heavy rain showers in the lagoon area southeast through north and to the east northeast. Multiple layers of clouds in shower areas. Light to heavy turbulence south.

STATE OF THE SEA:

Open Sea: Waves from 080 deg, period 4 seconds, height 4 feet.
Lagoon Side. Waves from 080 deg, period 3-4 seconds, height 1.5 feet.

CAN

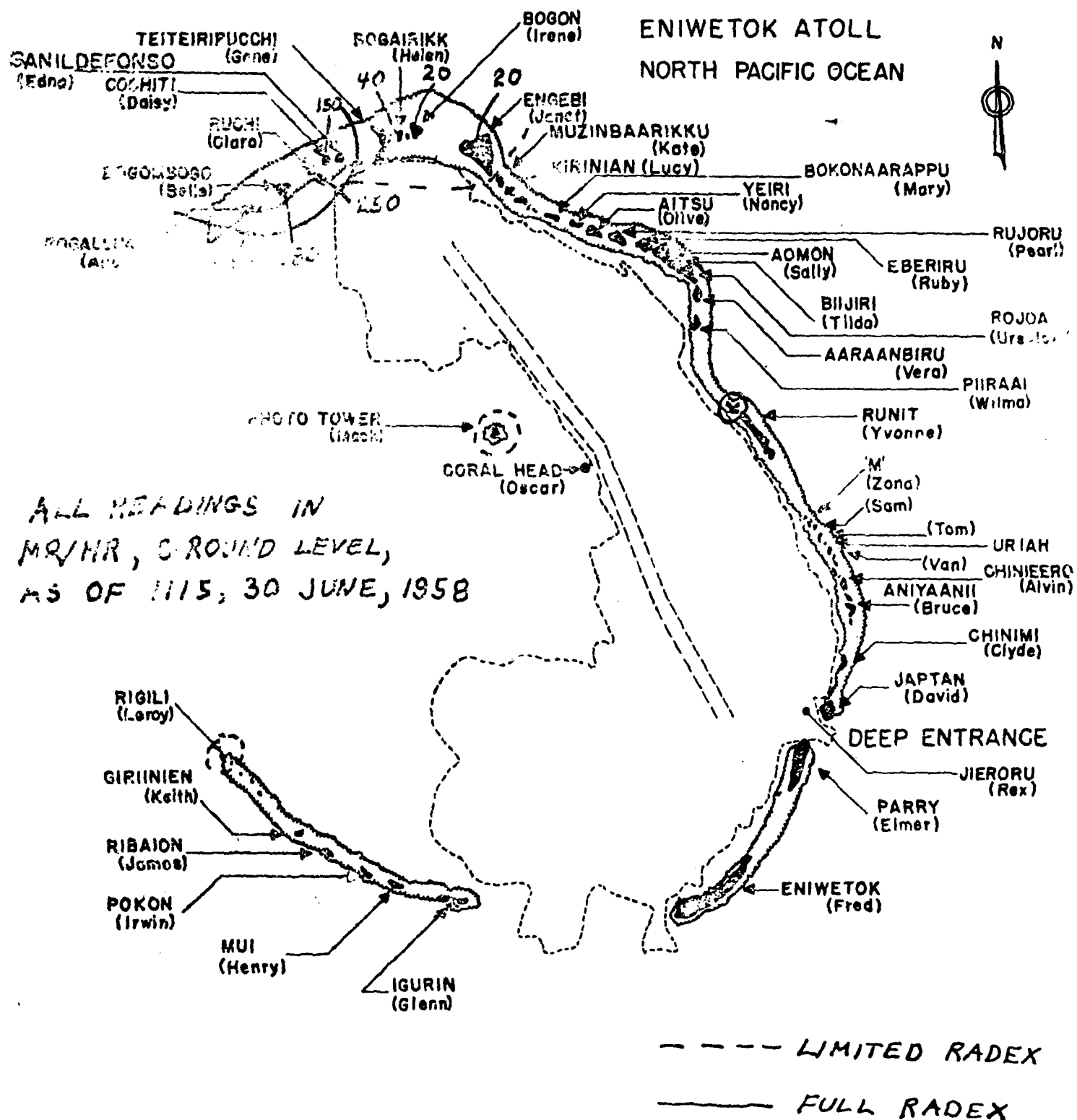
ENTRITION RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1009	Surface	25.5	22.5
1000	280	25.2	22.2
880	3,900	16.8	14.5
850	4,800	15.5	13.2
700	10,210	07.2	03.5
600	14,320	-00.2	-02.8
500	19,050	-07.2	-09.8
400	24,640	-17.8	-23.2
300	31,490	-32.8	-45.2
299	31,560	-33.2	-45.5
250	35,620	-42.2	Miss
200	40,420 440	-55.2	Miss
176	42,910	-62.0	Miss
150	46,240 270	-68.2	Miss
131	48,850	-74.0	Miss
124	49,740	-77.0	Miss
119	50,590	-71.0	Miss
100	56,050	-74.8	Miss
083	57,590	-78.0	Miss

OAK

ENTIRETY WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	120	2004
1,000	090	19
2,000	100	21
3,000	100	21
4,000	100	21
5,000	110	19
6,000	110	17
7,000	120	17
8,000	120	17
9,000	130	16
10,000	140	15
12,000	150	14
14,000	130	16
16,000	130	15
18,000	130	15
20,000	130	16
22,000	140	15
24,000	140	18
26,000	150	20
28,000	140	17
30,000	140	14
32,000	130	15
34,000	130	12
36,000	130	13
38,000	120	16
40,000	120	17
42,500	120	16
45,000	090	20
47,500	070	14
50,000	090	11
52,500	160	05
55,000	150	04
57,500	120 110	10



OAK EVENT

Radiological Surface Survey, D+1 Day

36

TAB F

INDEX

TAB

A--Summary, HIGHORY Event, Operation HARDTACK

B--Forecast Pullout Plot

C--Trajectory Plot

D--Surface and Air Radex

E--1. Forecast Radiograph

2. Shot-time Radiograph

3. Weather Summary

F--Radiological Surface Survey, H+3 Hours

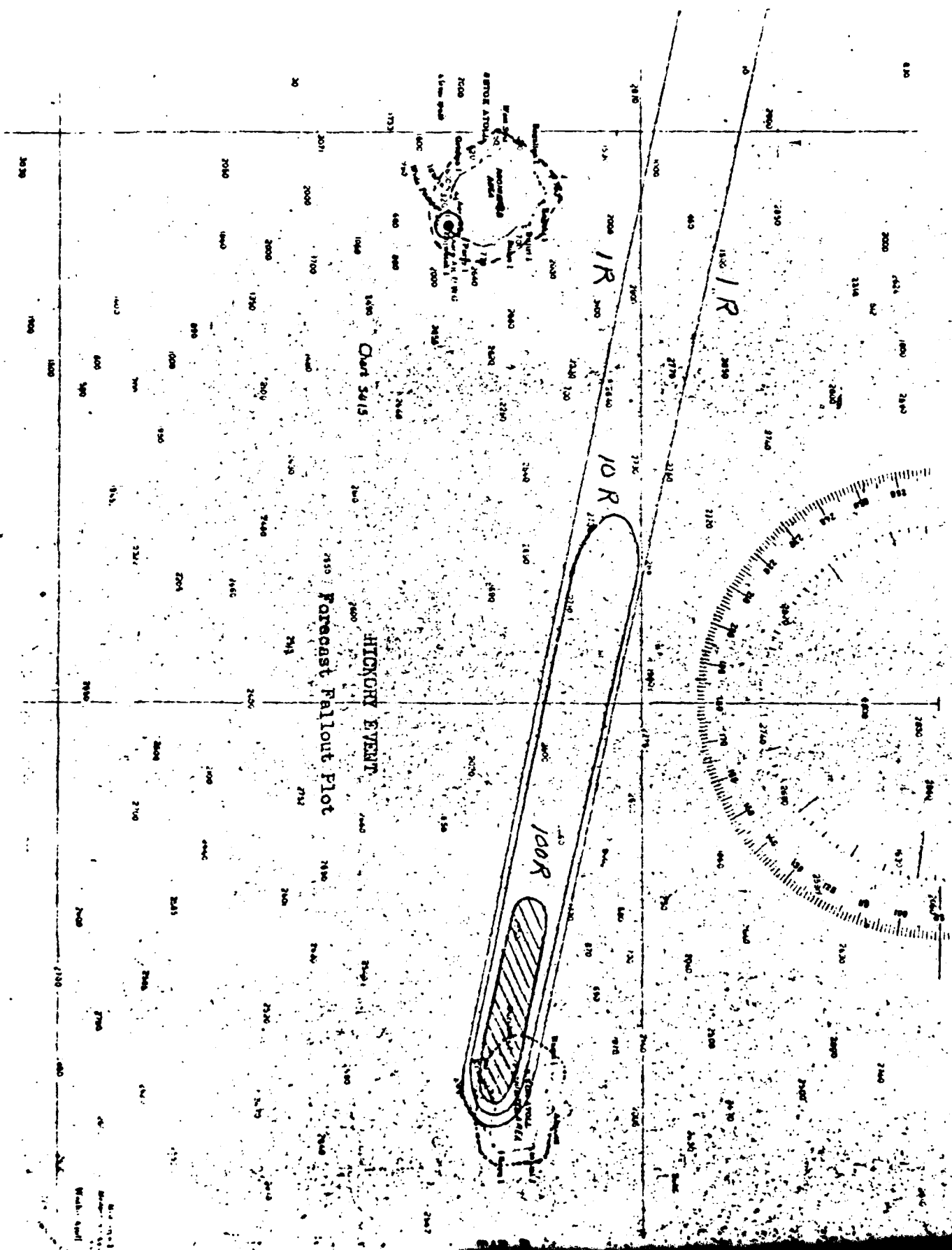
~~SECRET~~
OPERATION HARDTACK

1. The HICKORY device was detonated on a barge off the west end of Tare Island, Bikini Atoll, at 1200M, 29 June 1958. RadSafe operations were controlled through the USS Banner, located in Bikini Lagoon. []
[] The cloud rose immediately to 24,200 feet; the base was estimated at 12,000 feet.

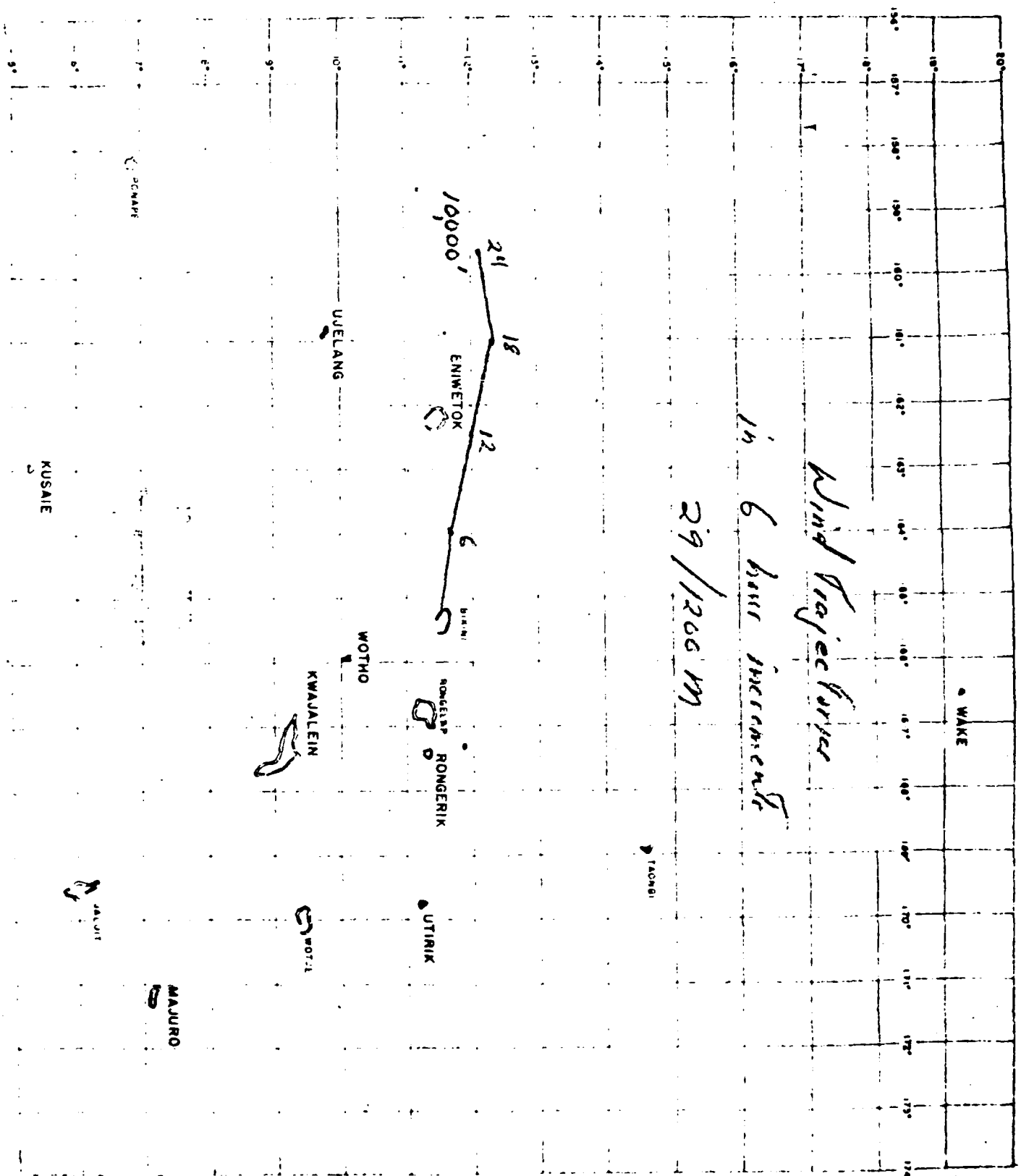
2. The P2V aircraft (Wildroot #5) reported over Nan at 1230M, and the cloud position had moved outside the northwestern corner of that atoll. Negative readings were obtained on the eastern side of the atoll, but some isolated hot rain showers were encountered in the vicinity west of ground zero. Maximum intensity in rain was recorded over Roger: 800 mr/hr, at 1305M.

3. The RadSafe helicopters took off at 1305M, and re-entry hour was declared at 1330M. The highest readings were obtained west of Tare Island at 100 mr/hr at 1335M.

4. The P2V was vectored on bearings of 260 degrees from Bikini for 75 miles and north for 30 miles, 50 miles out, to confirm the westernmost extent of the fallout pattern. Fallout was predicted along a bearing of 250 degrees, but it is estimated that the position was more southerly: 265 degrees. This is based upon P2V readings of 25 mr/hr made at 1600M, due west of Bikini at 5,000 feet.

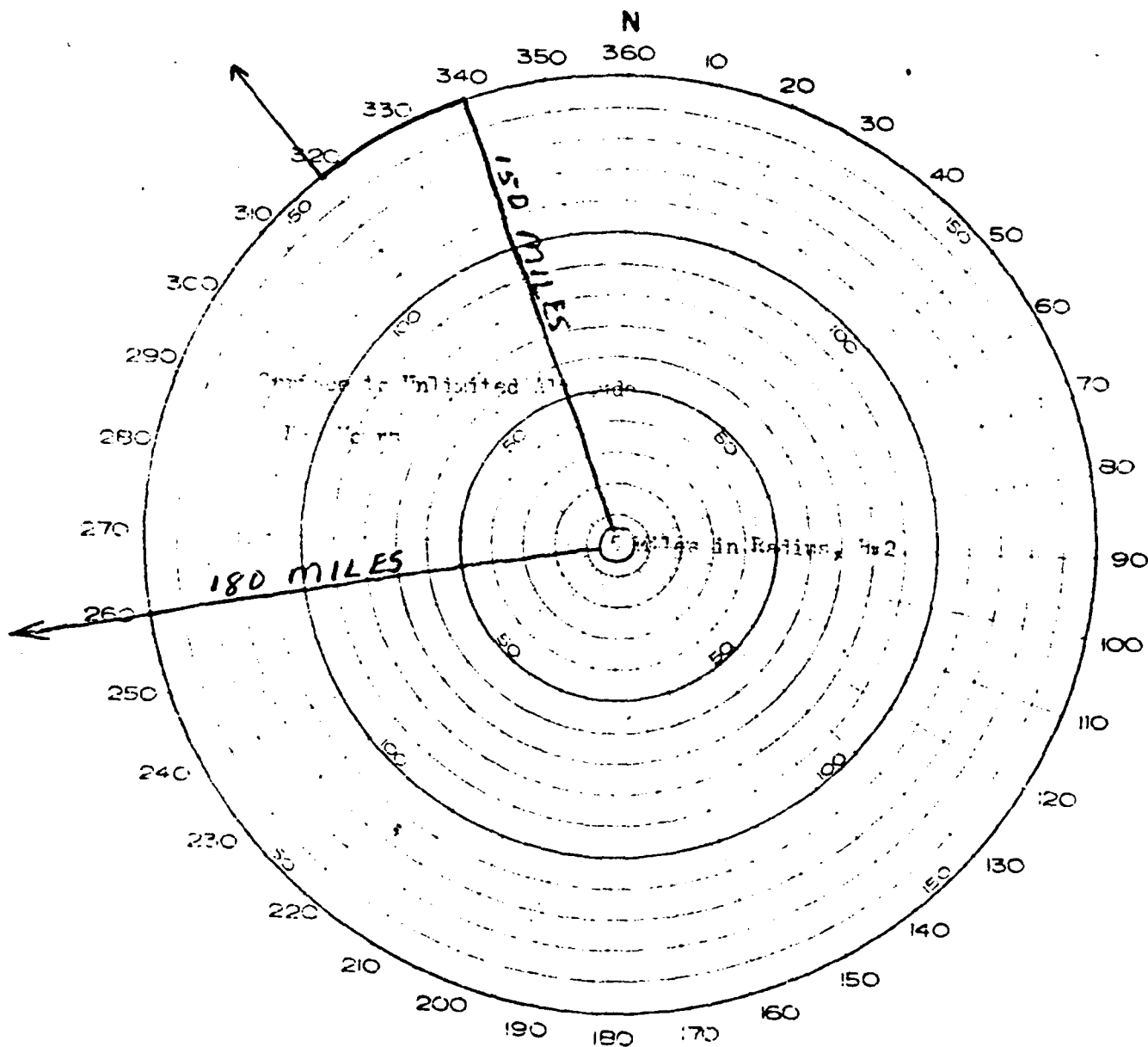


Wind direction
in 6 hour increments
29/1200 m



HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



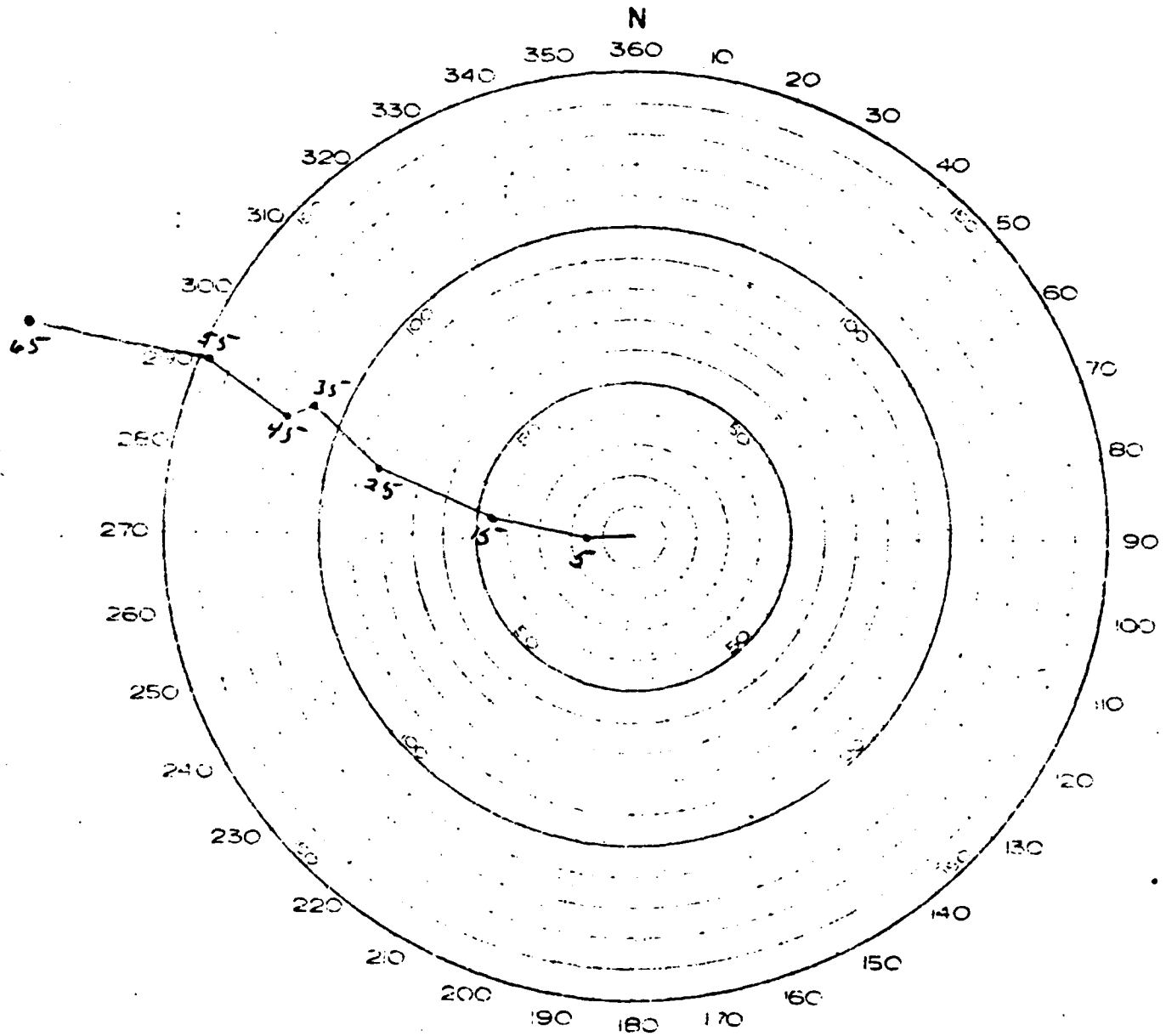
U.S. AIR FORCE

Surface to Unlifted Air

177 D

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



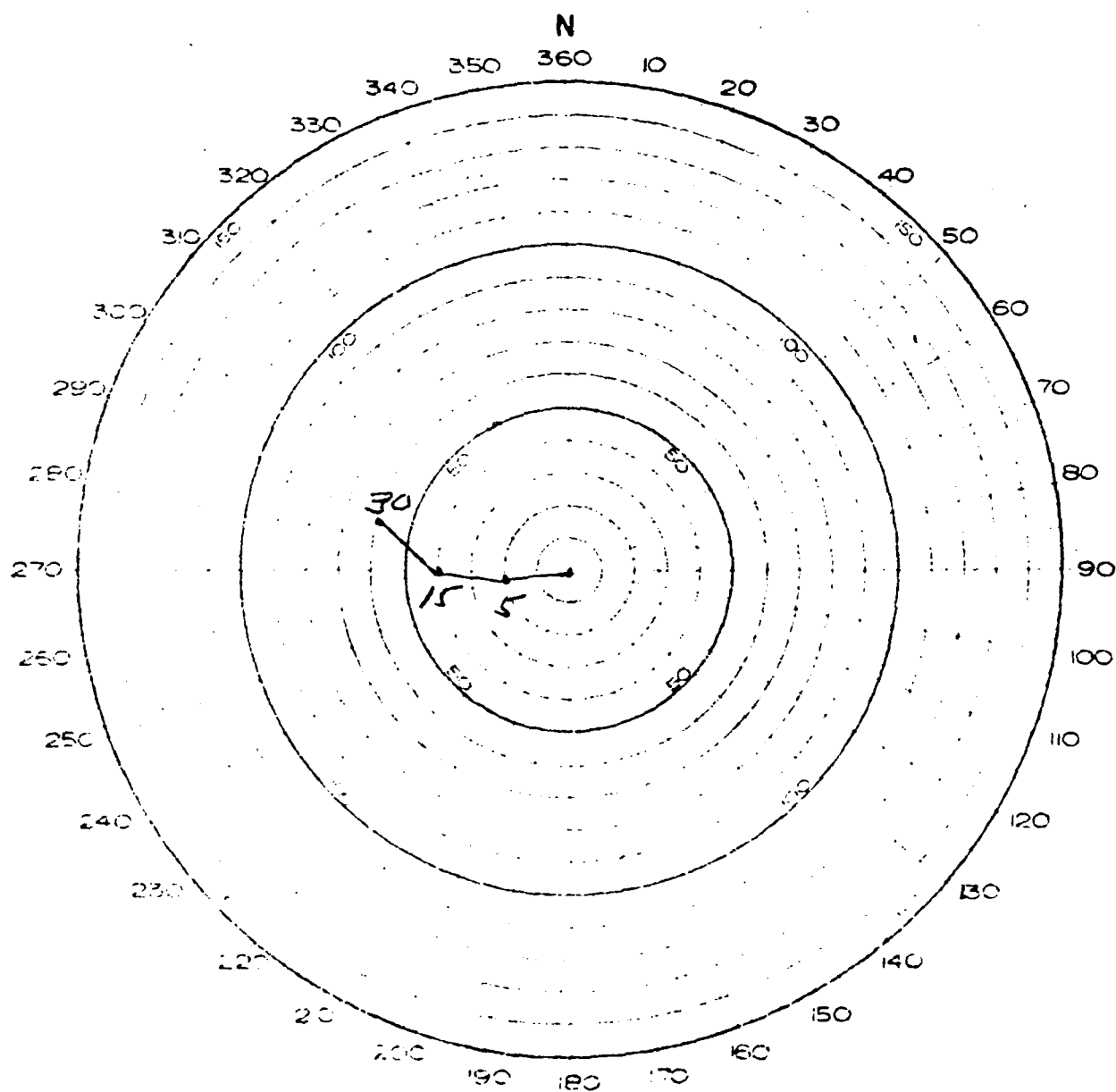
WINDS AND

Forecast Hodograph.

215-245

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



WIND IN EVENT

Time Hodograph

FIG. 2-2

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

3 JULY 1958

HUCKORY

BIKINI OBSERVED WEATHER FOR 29 JUNE 1958

SURFACE WEATHER:

Sea Level Pressure	1010.1 mbs
Free Air Surface Temperature	82.0° F
Wet Bulb Temperature	81.5° F
Dew Point Temperature	81.3° F
Relative Humidity	84%
Surface Wind	090° 08 knots
Visibility	10 Miles
Weather	None

CLOUDS:

Scattered (3/10) cumulus, bases 2,000 feet, tops unknown.
Scattered (3/10) altocumulus, bases unknown.

AREA WEATHER SUMMARY FROM AIRCRAFT:

Broken cirrus (6/10-8/10), bases 30,000 feet, tops 47,000 to 48,000 feet. Widely scattered showers west of Bikini.

STATE OF THE SEA:

Open Sea: Waves 6 to 8 feet high, period 5 to 6 seconds, length 75 to 110 feet.

Lagoon side: Waves 1 to 2 feet high, period 2 to 3 seconds.

HICKORY

BIKINI RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1009	Surface	27.2	22.5
1000	280	26.8	22.2
850	4,950	21.2	14.2
800	5,653	19.2	11.8
700	10,380	11.5	05.8
600	14,550	03.2	-01.5
500	19,310	-05.2	-09.5
423	23,665	-12.8	-16.8
400	24,970	-15.0	-23.0
380	25,656	-16.2	-26.5
300	31,900	-30.2	-40.5
250	36,060	-40.2	-55.5
200	40,920	-53.0	Miss
150	46,770	-66.2	Miss
118	51,476	-76.0	Miss
100	54,560	-76.5	Miss
082	58,202	-77.0	Miss
070	61,384	-72.0	Miss
066	62,533	-65.0	Miss
050	68,030	-65.0	Miss
046	69,718	-60.0	Miss
038	73,580	-64.0	Miss
036	74,803	-55.0	Miss
025	82,380	-50.5	Miss
015	93,396	-46.0	Miss

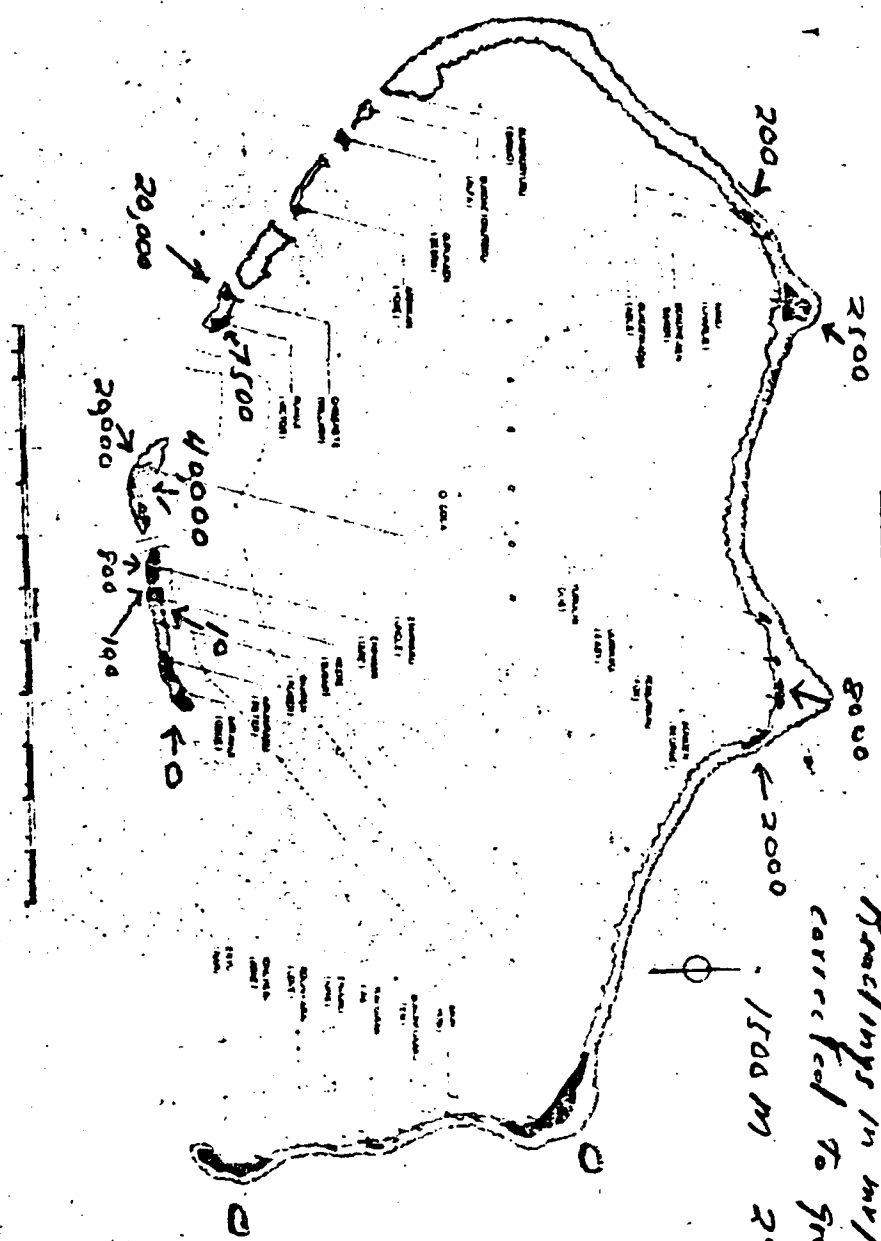
HICORY

BIKINI WINDS ALFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	090	10
1,000	080	20
2,000	080	20
3,000	080	23
4,000	090	21
5,000	090	21
6,000	090	18
7,000	090	19
8,000	090	17
9,000	090	15
10,000	100	16
12,000	100	12
14,000	110	14
16,000	100	17
18,000	110	18
20,000	110	10
22,000	110	09
23,000	100	08
24,000	050	09
25,000	060	05
26,000	040	05
28,000	100	02
30,000	Calm	
32,000	050	06
34,000	140	05
35,000	160	07

MAP OF BIKINI ATOLL

*Helicopter Survey
Readings in m/s -
corrected to ground*



Redington's Surface Survey

INDEX

TAB

A--Summary, SEQUOIA Event, Operation HARDTACK

B--Forecast Fallout Plot

C--Trajectory Plot

D--Surface and Air Radar

E--1. Forecast Hodograph

2. Shot-time Hodograph

3. Weather Summary

F--Radiological Surface Survey, H+8 Hours

SEQUOIA EVENT
OPERATION HARDTACK

1. SEQUOIA was detonated on a barge one-half mile west of Yvonne Island, Eniwetok Atoll, at 0630M, 2 July 1958. The cloud rose initially to 1,700 feet, then stabilized at 15,000 feet. Movement took place within the trade wind level and averaged 275 degrees at 17 knots.

2. The P2V reported early and started the lagoon survey at 0648M. Readings of 30 to 40 mr/hr were taken over debris in the water west of Yvonne. A reading of 12 r was found over the Yvonne air strip at 0725M. No other significant readings were obtained, so re-entry hour was declared at H+2 hours.

3. The fallout pattern lay between the radials 260 degrees to 290 degrees from ground zero and extended for eighty miles. Essentially all of the fallout came down within the forecast radex area.

C

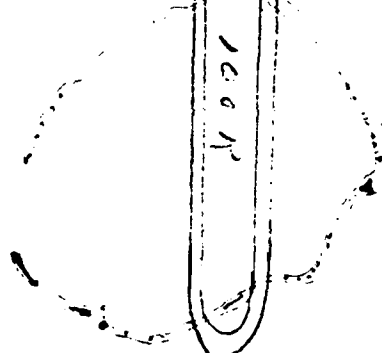
C

C

C

1000

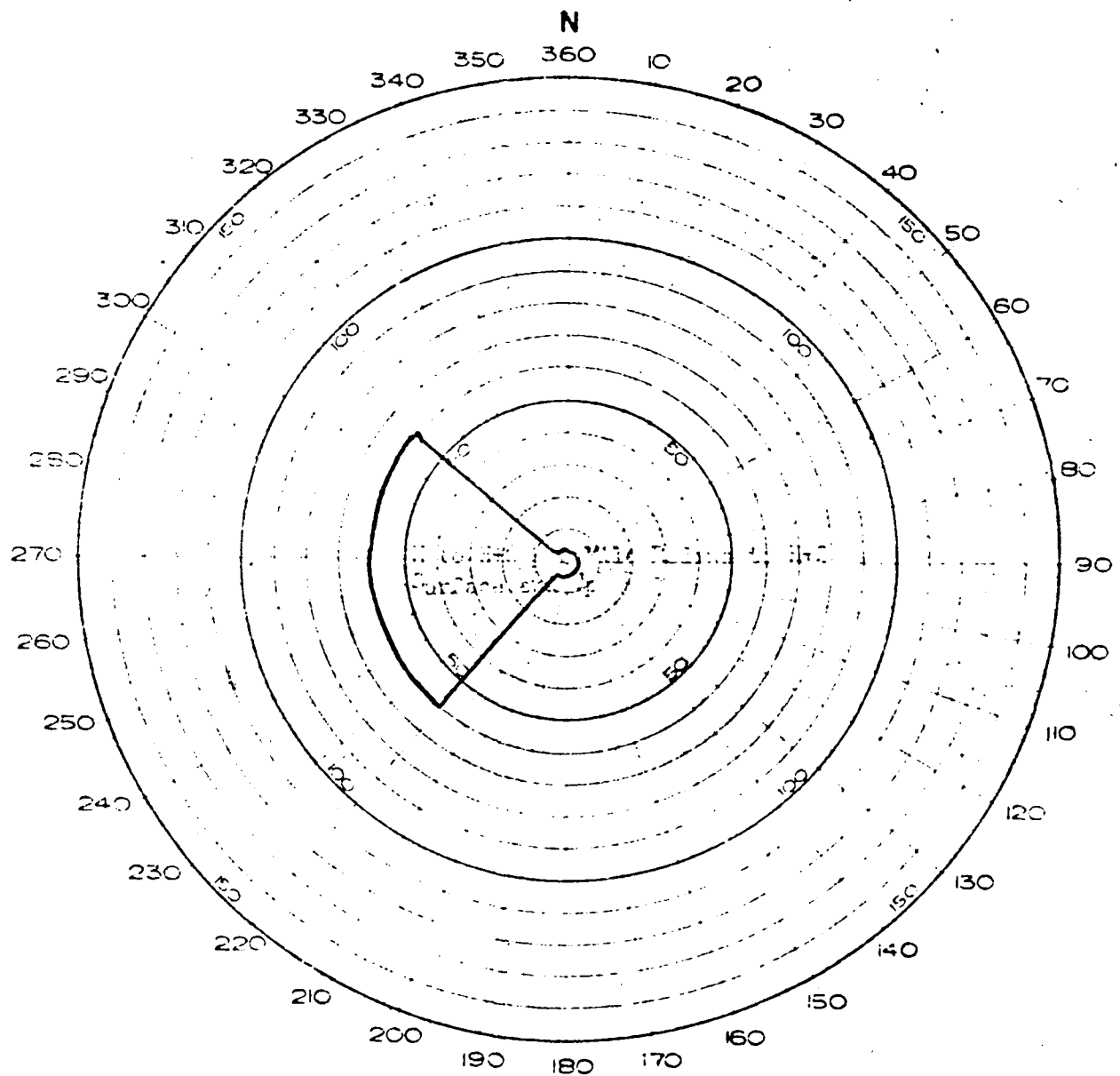
1000



1000

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



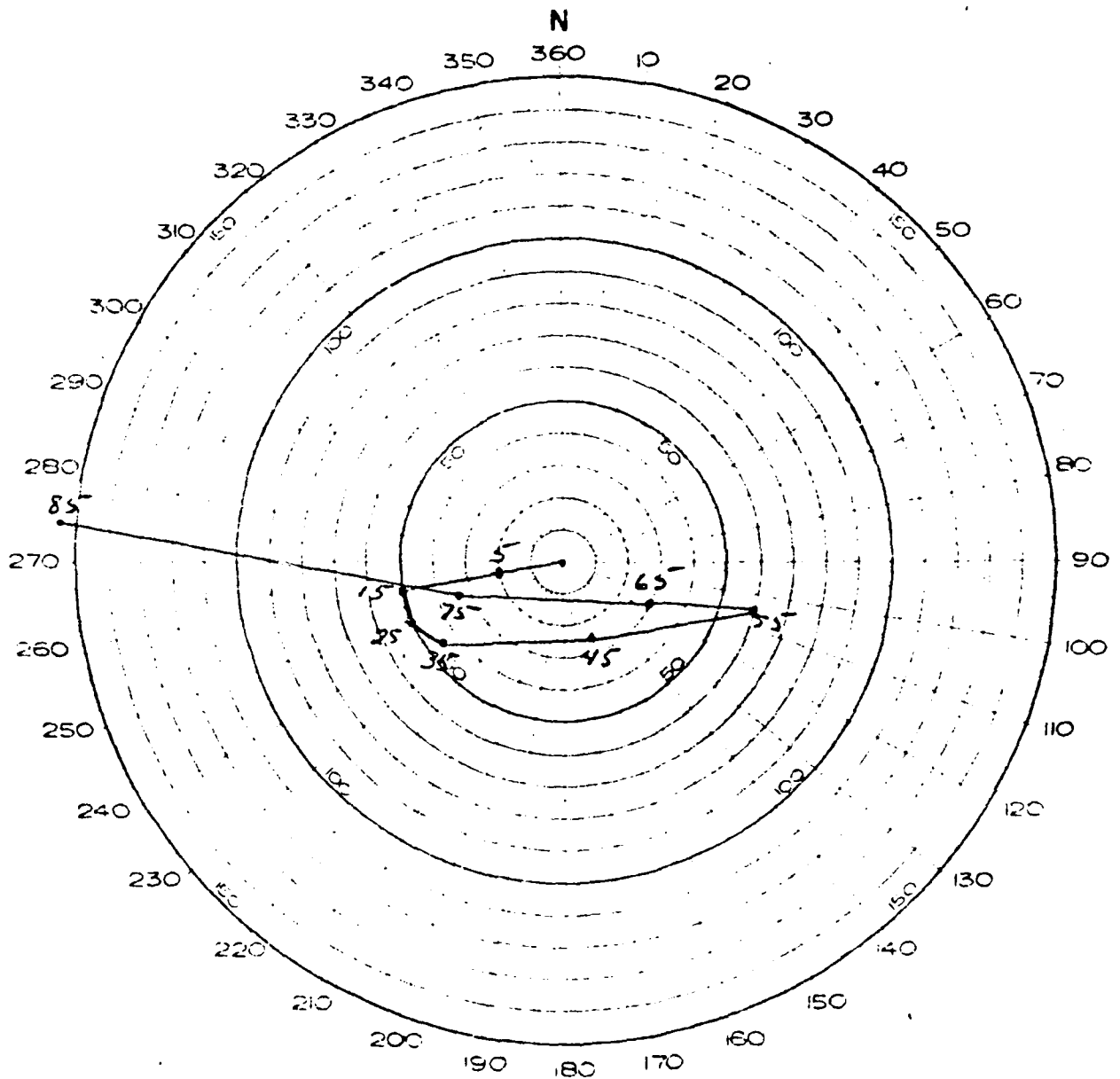
SEQUOIA EVENT

Surface and Air Radex

HODOGRAPH

RESULTANT WINDS AND

SURFACE RADEX

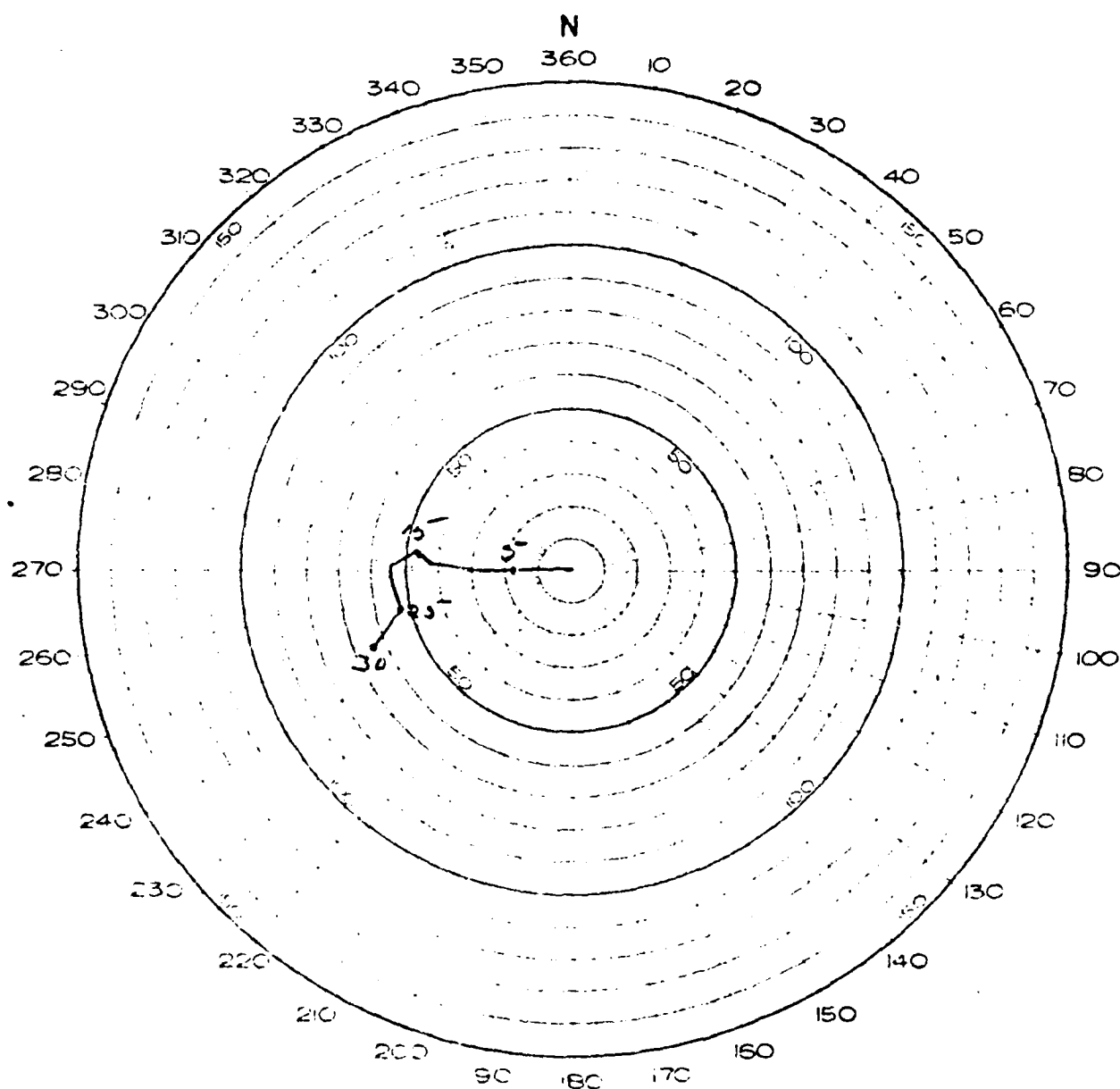


SEQUENCE

1. 2. 3. 4. 5. 6. 7. 8. 9. 10.

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



SEQUOIA EVENT

300-1-time Hodograph

7.5 L-2

RADSAF

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

SEQUOIA

3 JULY 1958

ENHANCED OBSERVED WEATHER FOR 2 JULY 1958

SURFACE WEATHER:

Sea Level Pressure	1007.3 mbs
Free Air Surface Temperature	80.9° F
Wet Bulb Temperature	77.0° F
Dew Point Temperature	76.0° F
Relative Humidity	83.5%
Surface Wind	090° 17 knots
Visibility	10 Miles
Weather	RM- Increasing to RM+

CLOUDS:

Scattered (3/10) cumulus, bases 1,400 feet, tops unknown, increasing to broken (8/10) cumulus, bases lowering to 500 feet in heavy rainshowers tops unknown. Broken (6/10) cirriform, bases unknown.

AIR WEATHER SUMMARY FROM AIRCRAFT:

None.

STATE OF THE SEA:

Open Sea: Waves 4 to 6 feet high, period 4 to 5 seconds, length 50 to 75 feet.

Lagoon side. Waves 1 foot high, period 1 to 2 seconds.

STQUOIA

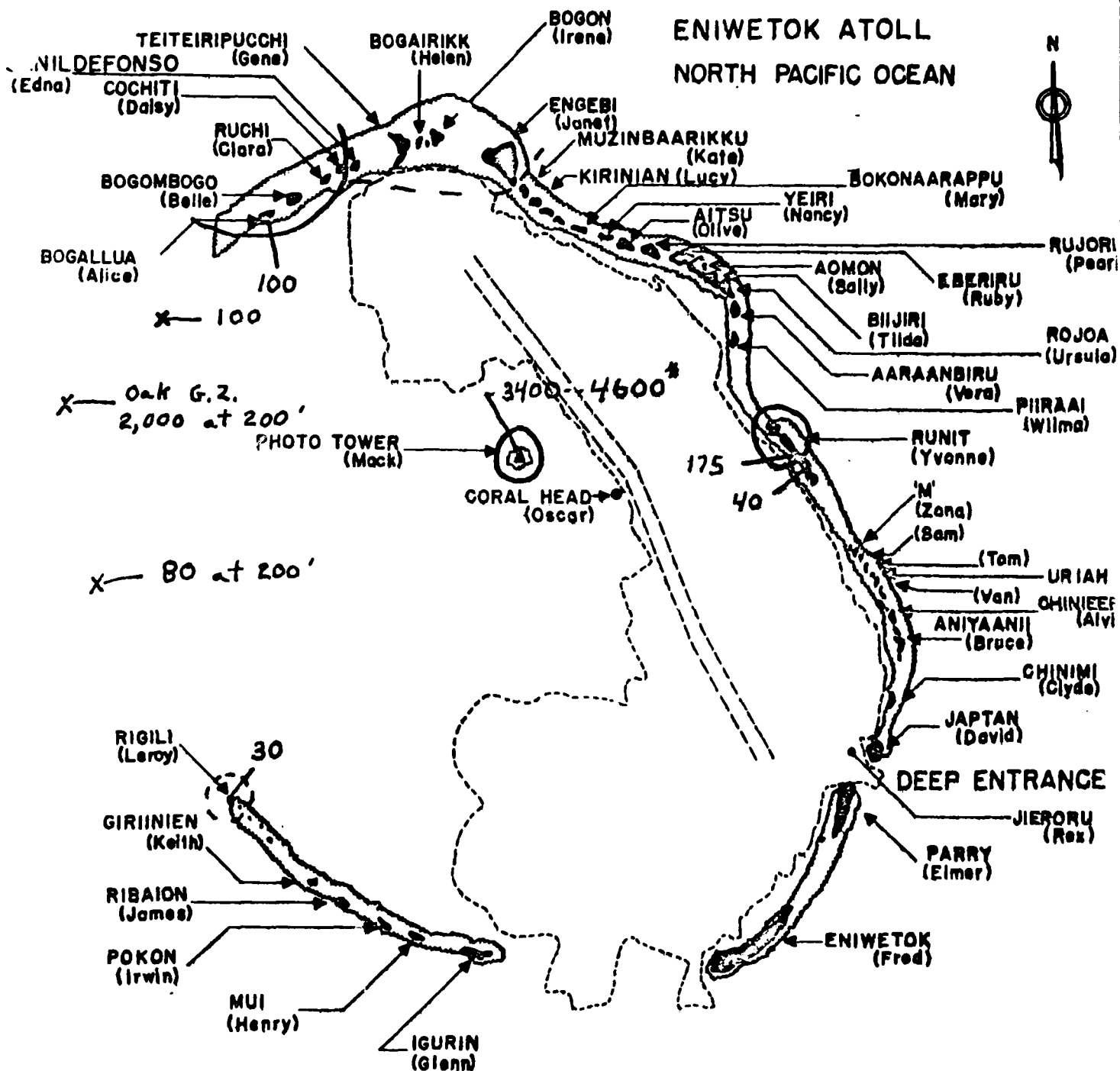
ENIMETOK FADIOSOL'DE OBSERVATION

<u>Pressure</u> (Millibars)	<u>Height</u> (Feet)	<u>Temperature</u> (°C)	<u>Dew Point</u> (°C)
1006	Surface	27.5	22.8
1000	190	27.2	23.2
862	4,462	18.5	16.2
850	4,850	18.5	15.2
777	7,349	14.5	11.5
706	10,039	12.5	-11.8
700	10,240	12.2	-10.8
600	14,410	03.2	-13.2
564	16,043	-01.5	-15.2
541	17,126	-01.2	-20.5
500	19,180	-04.8	Miss
440	22,507	-11.5	-28.5
419	23,753	-13.2	-19.5
400	24,820	-15.8	-22.2
324	29,954	-26.5	-40.5
300	31,730	-31.0	Miss
250	35,860	-42.1	Miss
200	40,680	-55.1	Miss
150	46,530	-66.0	Miss
115	51,837	-75.0	Miss
100	54,730	-71.4	Miss
080	59,052	-72.0	Miss
050	68,360	-63.0	Miss
042	72,014	-61.0	Miss
037	74,606	-56.0	Miss
036	75,131	-54.0	Miss
025	82,790	-52.9	Miss

STUDIA

ENTIRE WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	090	10
1,000	090	17
2,000	090	19
3,000	100	19
4,000	100	23
5,000	100	20
6,000	100	19
7,000	100	19
8,000	100	22
9,000	100	18
10,000	100	16
12,000	110	17
14,000	130	13
16,000	120	09
18,000	050	06
20,000	040	11
22,000	320	16
24,000	360	20
26,000	320	14
28,000	330	11
30,000	010	13
32,000	010	15
35,000	020	16
36,000	020	16
38,000	010	21
40,000	010	24
42,500	020	32
45,000	020	31
47,500	010	21
50,000	270	23
52,500	310	22
55,000	010	16
57,500	090	12
60,000	080	12
65,000	100	24
70,000	090	36
75,000	100	48
80,000	090	49
85,000	100	63
90,000	090	68
95,000	090	78
100,000	090	85
105,000	100	85
109,000	110	82



ALL READINGS IN
MR/HR, AS OF 1500,
2 ~~PM~~, 1958
JULY

* Lower Platform - 3400
Upper Platform - 4600

--- LIMITED RADEX
— FULL RADEX
SEQUOIA EVENT

Radiological Surface Survey, H+8 Hours

INDEX

TAB

A—Summary, CEDAR Event, Operation HARDTACK

B—Forecast Fallout Plot

C—Trajectory Plot

D—Surface and Air Radex

E—1. Forecast Hodograph

2. Shot-time Hodograph

3. Weather Summary

F—Radiological Surface Survey, H+3 Hours

CEDAR EVENT
OPERATION HARDTACK

1. The CEDAR device was detonated on a barge 3,000 feet northwest of Charlie Island [redacted] Bikini Atoll, at 0530M, 3 July 1958. RadSafe operations were controlled through the USS Benner, located in Bikini Lagoon. [redacted] The cloud rose to 50,000 feet, with the base estimated at 35,000 feet.

2. The P2V aircraft (Wildroot #13) reported over Nan at 0600M, and it was vectored cautiously over the lagoon at 1,000 feet. The highest reading taken was over Dog: 49 mr/hr at 0744M. Later, after clearing the lagoon, the P2V was vectored out on radials; for example, 270 degrees for 90 miles and return.

3. The RadSafe helicopter took off at 0700M. The highest reading was made over Charlie: 400 mr/hr.

4. Fallout was predicted along a bearing of ten degrees; however, the wind pattern had been displaced to the west in the lower altitudes, causing light fallout along a westerly bearing. The P2V aircraft verified this shift with readings from 20 mr/hr to 90 mr/hr out to fifty miles west of the ground zero through 0200M.

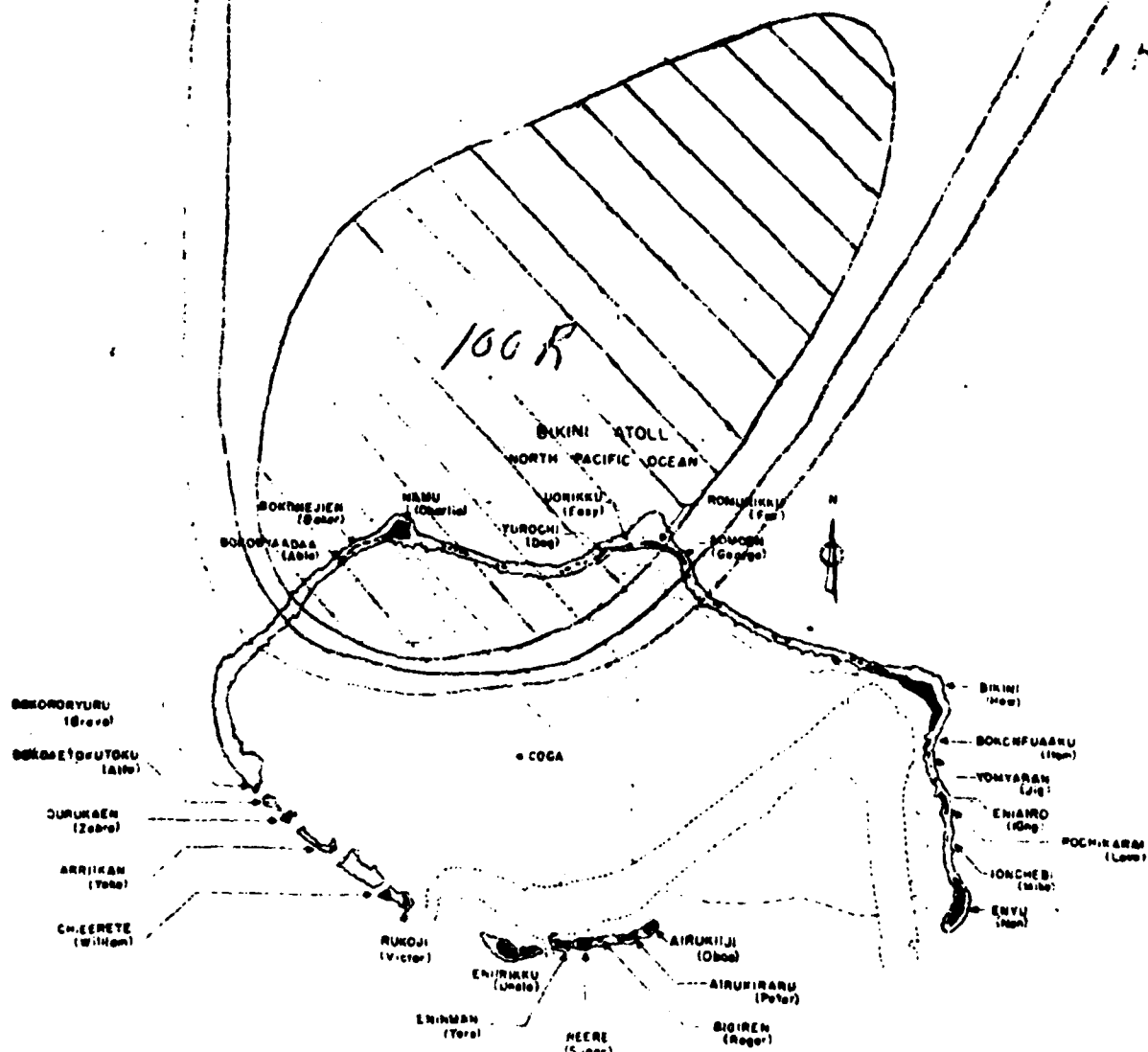
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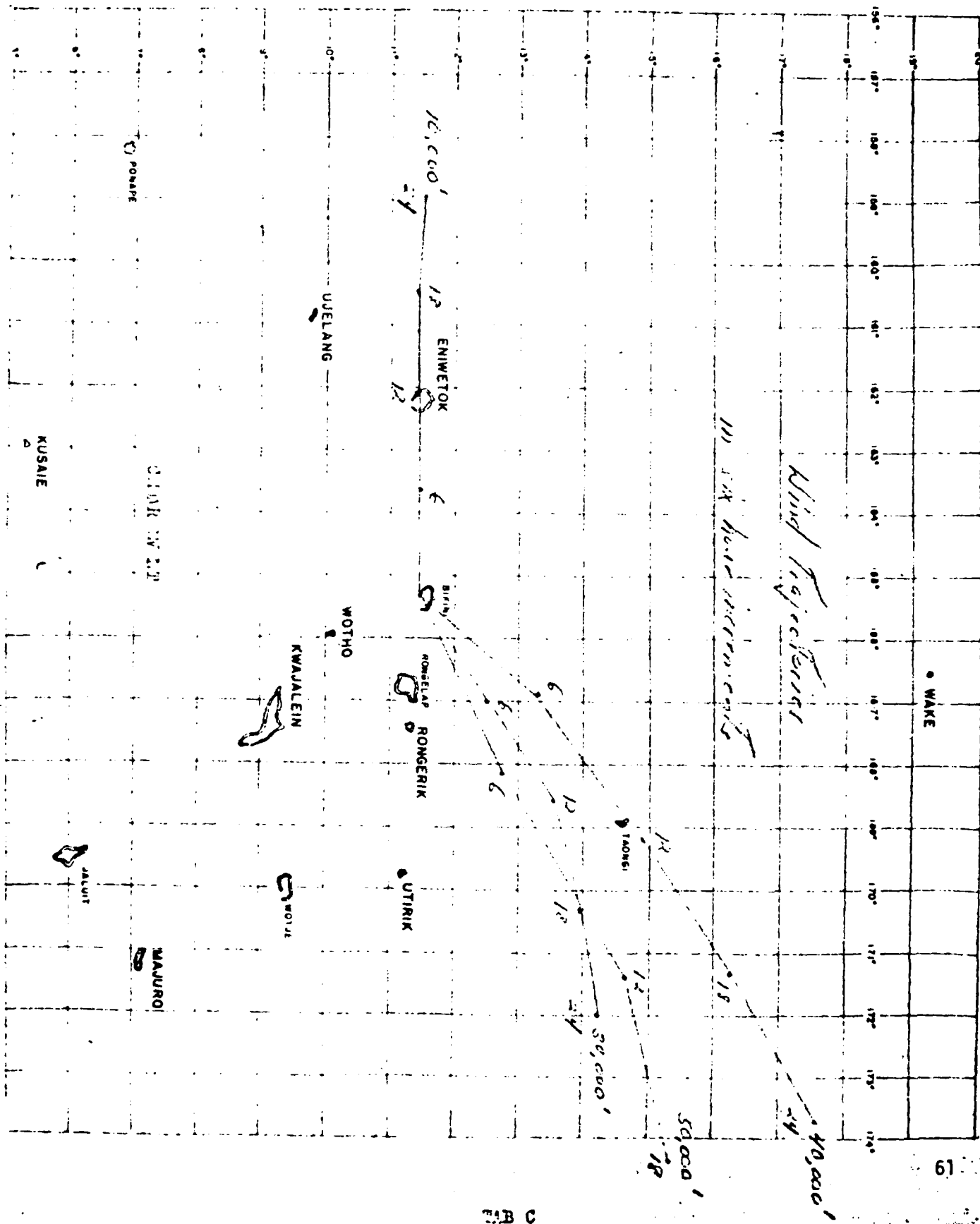
100 R

100 R

18

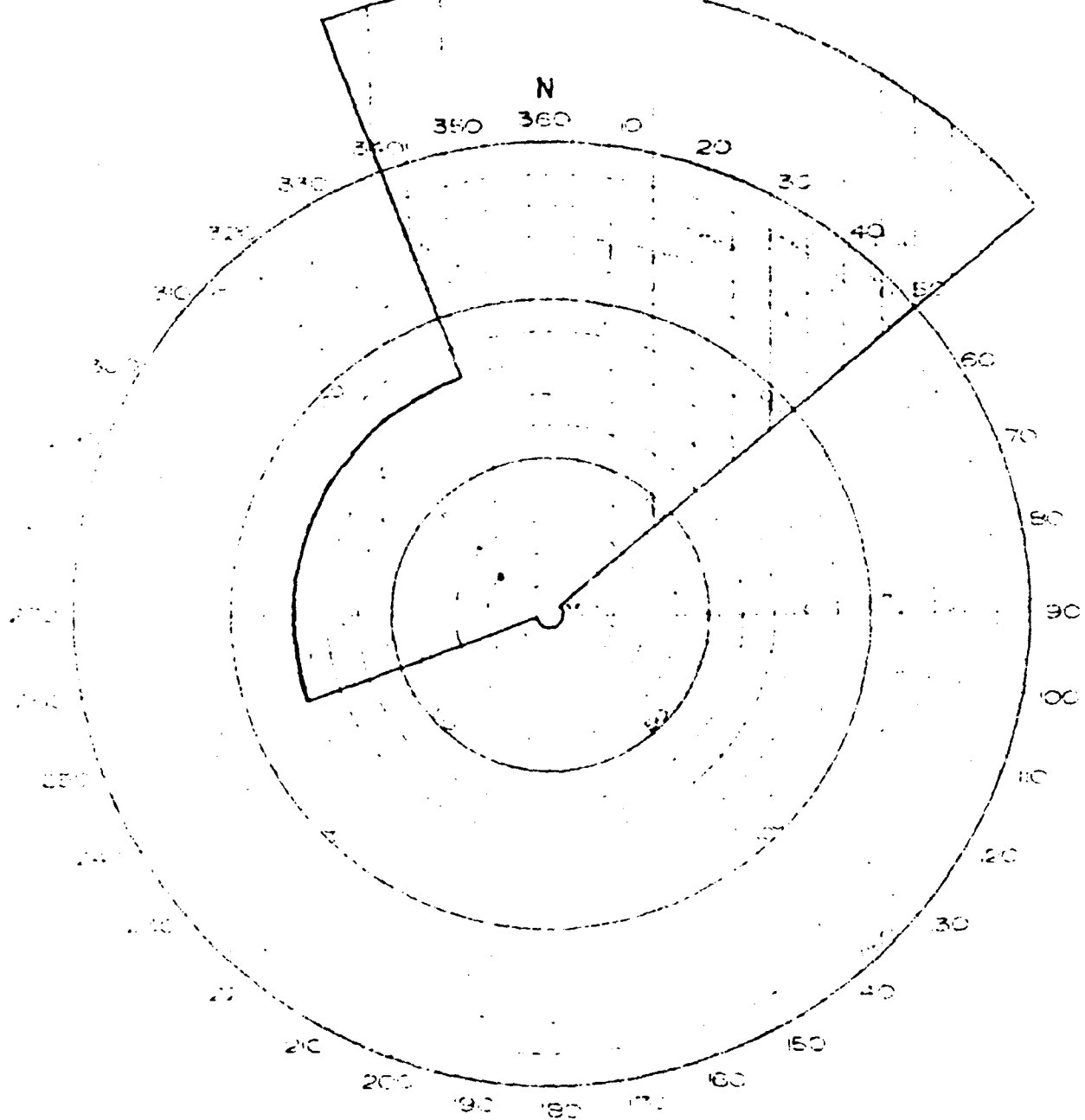
OFFICIAL AIR CHART





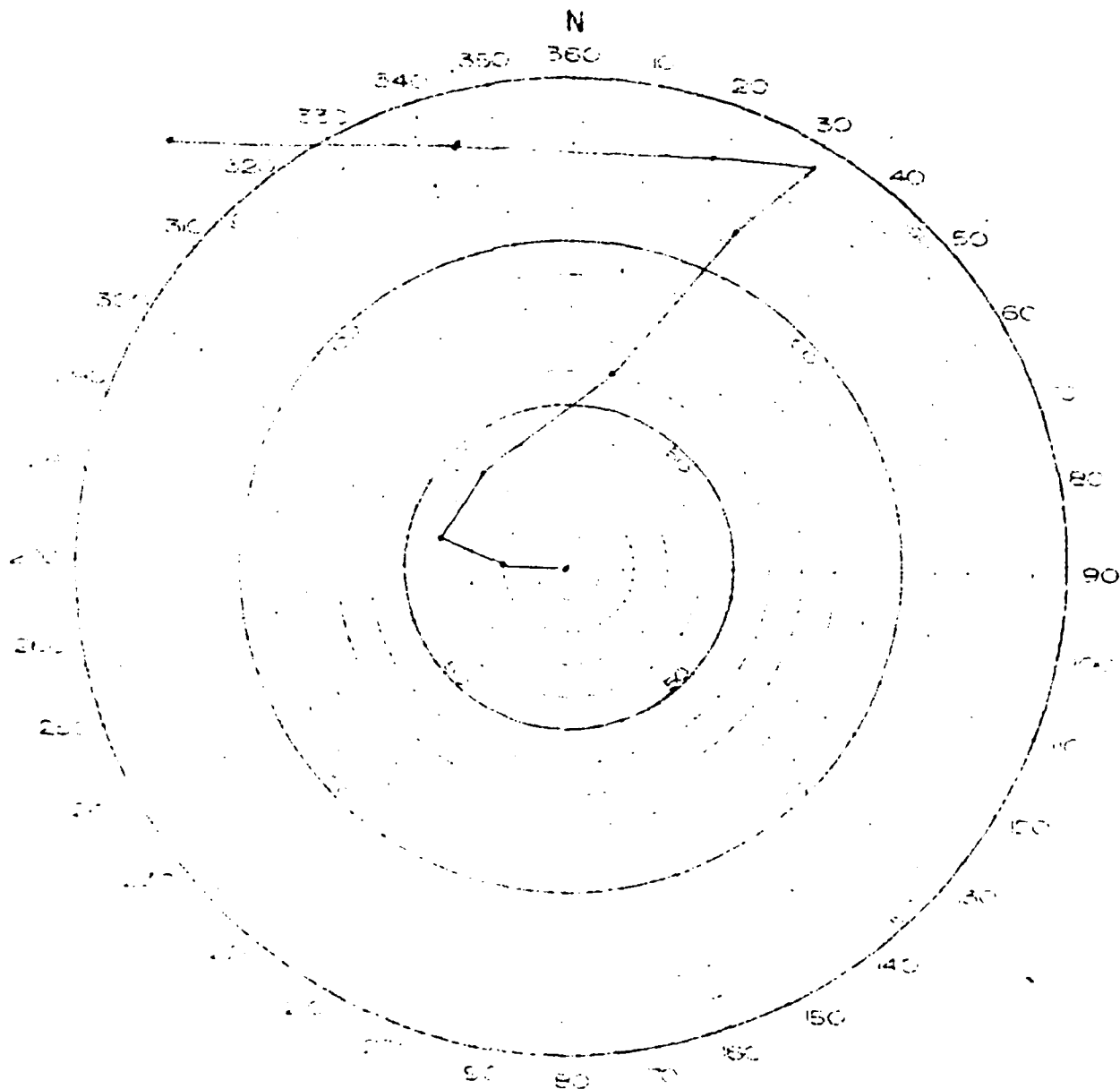
HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



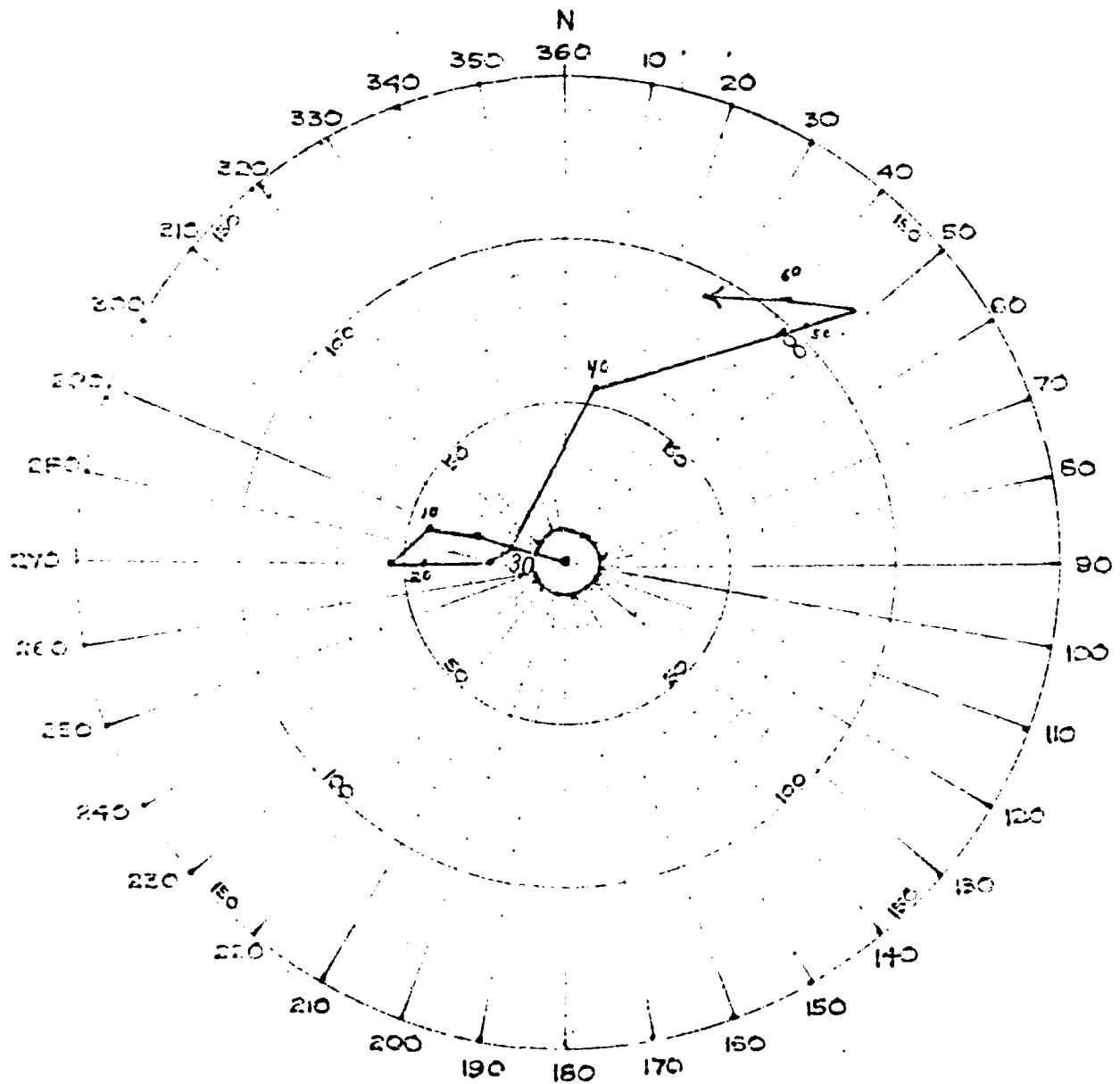
HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



CEDAR EVENT

Shot-Time Hodograph

HEADQUARTERS

JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

5 JULY 1958

CEDAR

BIKINI OBSERVED WEATHER FOR 5 JULY 1958

SURFACE WEATHER:

Sea Level Pressure	1010.2 mb
Free Air Surface Temperature	83.2° F
Wet Bulb Temperature	78.1° F
Dew Point Temperature	76.3° F
Relative Humidity	79%
Surface Wind	070° 16 knots
Visibility	10 miles
Weather	Widely Scattered -RW

CLOUDS:

Scattered (2/10) cumulus, bases 2,000 feet, tops unknown.
Scattered (3/10) altocumulus, bases 14,000 feet, tops unknown.
Broken (7/10) cirriform bases 22,000 feet, tops unknown.

AREA WEATHER SUMMARY FROM AIRCRAFT:

None.

STATE OF THE SEA:

Open Sea: Waves 5 to 7 feet high, period 4 to 5 seconds,
length 50 to 75 feet.
Lagoon Side: Waves 1 to 2 feet high, period 2 to 3 seconds.

USDA

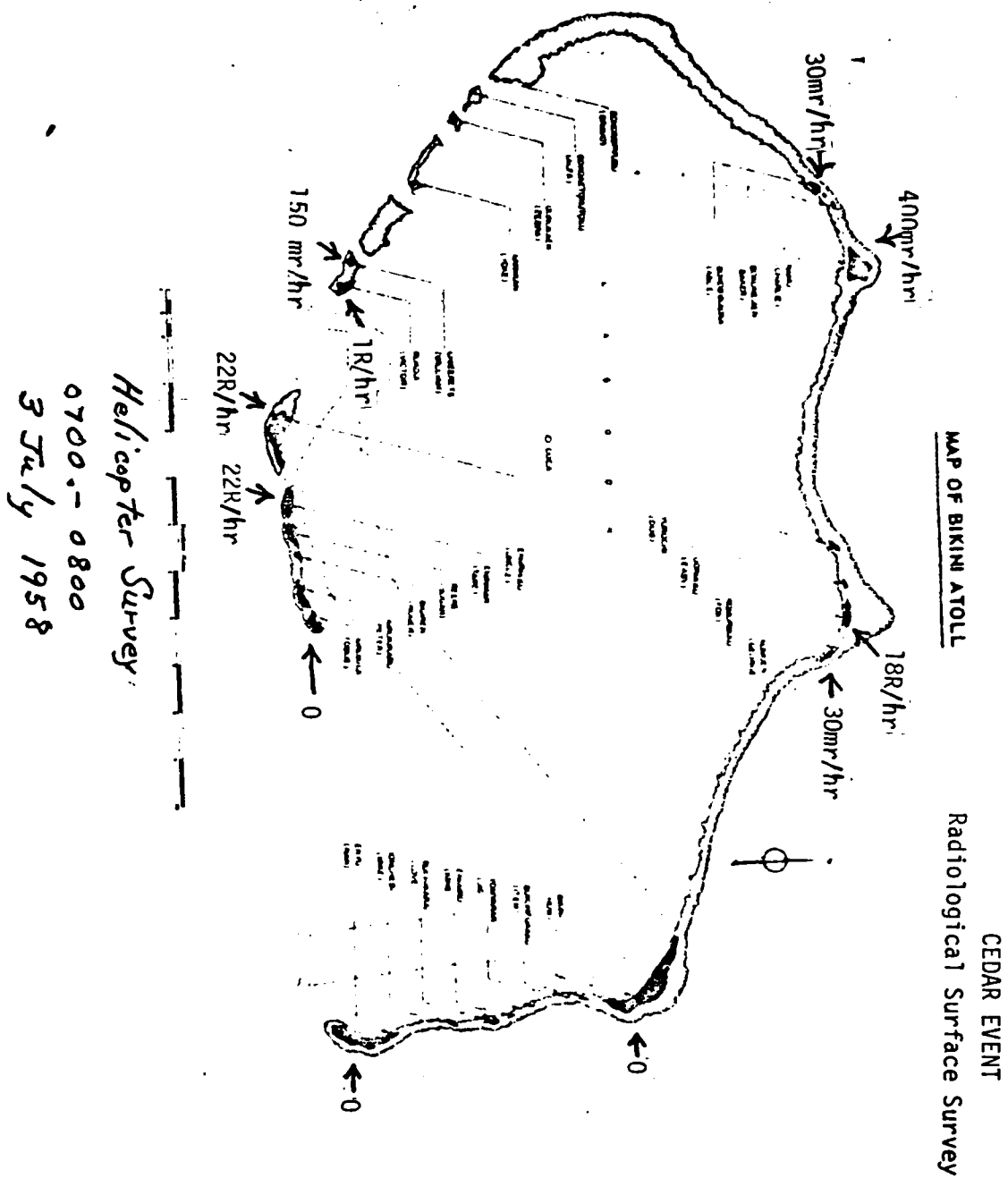
BIMINI RADIOSOUNDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1008	Surface	28.2	25.8
1000	250	28.2	25.2
850	4,530	18.5	17.2
846	5,118	18.2	16.8
700	10,310	10.5	
696	10,499	10.5	
679	11,188	10.2	
600	14,480	03.2	
562	16,273	00.5	
525	18,012	-02.5	-12.5
520	18,274	-03.5	-12.5
510	18,766	-03.5	-12.5
500	19,260	-04.2	-12.5
481	20,276	-05.8	-12.5
472	20,768	-07.2	-12.2
400	24,920	-15.5	-25.8
317	30,512	-27.5	-40.5
300	31,790	-30.8	Miss
250	35,594	-31.2	Miss
200	40,790	-53.2	Miss
150	46,600	-56.0	Miss
120	51,115	-75.0	Miss
116	51,804	-75.0	Miss
111	52,592	-70.0	Miss
100	54,540	-73.0	Miss
092	56,233	-78.0	Miss
090	56,627	-75.0	Miss
082	58,432	-71.0	Miss
073	60,761	-72.0	Miss
056	65,879	-66.0	Miss
050	68,070	-57.2	Miss
031	78,051	-56.0	Miss
025	82,590	-53.0	Miss

CEDAR

BUOY WINDS ALONG OBSERVATION

<u>Height</u> <u>(Feet)</u>	<u>Direction</u> <u>(Degrees)</u>	<u>Velocity</u> <u>(Knots)</u>
Surface	090	10
1,000	090	23
2,000	100	25
3,000	110	26
4,000	110	25
5,000	110	24
6,000	110	21
7,000	100	21
8,000	100	22
9,000	100	18
10,000	090	17
12,000	080	14
14,000	030	11
16,000	030	12
18,000	350	03
20,000	270	10
22,000	270	16
24,000	270	12
26,000	260	11
28,000	270	15
30,000	230	18
32,000	230	24
34,000	210	33
36,000	200	28
38,000	200	31
40,000	210	35
42,500	230	20
45,000	250	41
47,500	260	32
50,000	250	24
52,500	240	23
55,000	260	17
57,500	030	12
60,000	090	19
65,000	070	22
68,000	100	41



INDEX

TAB

A--Summary, DOGWOOD Event, Operation HARDTACK -

B--Forecast Fallout Plot

C--Trajectory Plot

D--Surface and Air Radar

E--1. Forecast Radiograph

2. Shot-time Radiograph

3. Weather Summary

F--Radiological Surface Survey, H-6 Hours

DOGWOOD EVENT

OPERATION HARDTACK

1. The DOGWOOD device was detonated on a barge one mile southwest of Janet Island, Eniwetok Atoll, at 0630M, 6 July 1958. The cloud rose immediately to 58,000 feet, then stabilized at 54,000 feet, while the base levelled off at 35,000 feet. Radar fixes from the weather radar at Fred indicated a movement of the main body of the cloud of 330 degrees at 17 knots. Aircraft reported that the cloud did not shear during the first hour.

2. The P2V started the lagoon survey at 0645M and completed it one hour later. No contamination was found except on Janet and the islands downwind of ground zero. Alice read 1,000 mr/hr; Irene, 2,900 mr/hr; and Janet, 35 mr/hr. The helicopter survey commenced at 0845M and confirmed the above readings. Re-entry hour was declared at H+3.

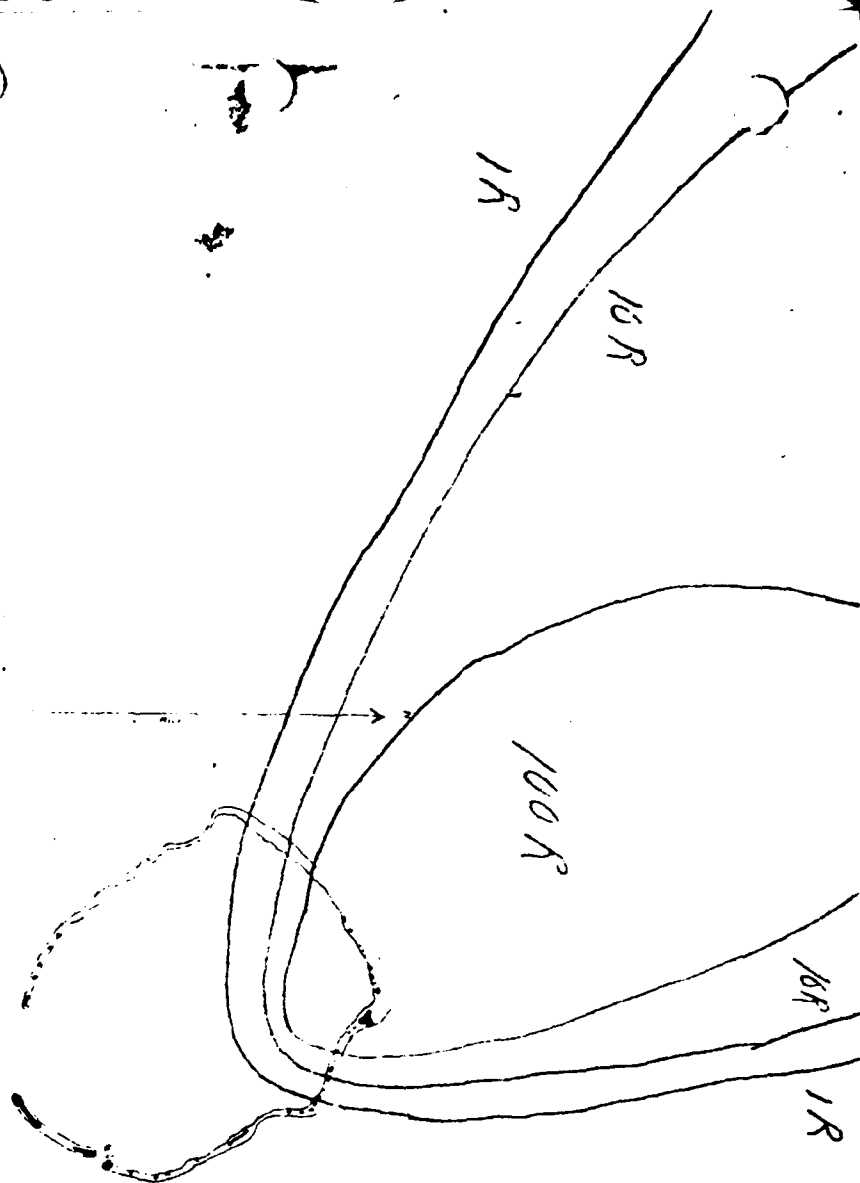
3. The P2V was dispatched on a track of 260 degrees from Alice and read 300 mr 35 miles out. It was then sent due north of Pearl and found unexpectedly an intensity of 700 mr at a point 25 miles north. At this time the P2V reported that his background would not fall below 130 mr/hr, in spite of repeated attempts to wash himself off in rain squalls. He was instructed to land, and a replacement was called for.

4. The standby P2V was sent to the north to discern whether or not contaminated air was moving eastward. A reading of 180 mr/hr was taken at

a point on the 350-degree radial, forty miles from Pearl, which indicated that fallout was present in the same area and that the situation would bear watching.

5. The P2V was sent north of Pearl again at 1400 hours, but no significant readings were obtained. This showed that no easterly movement was present, so the P2V was released.

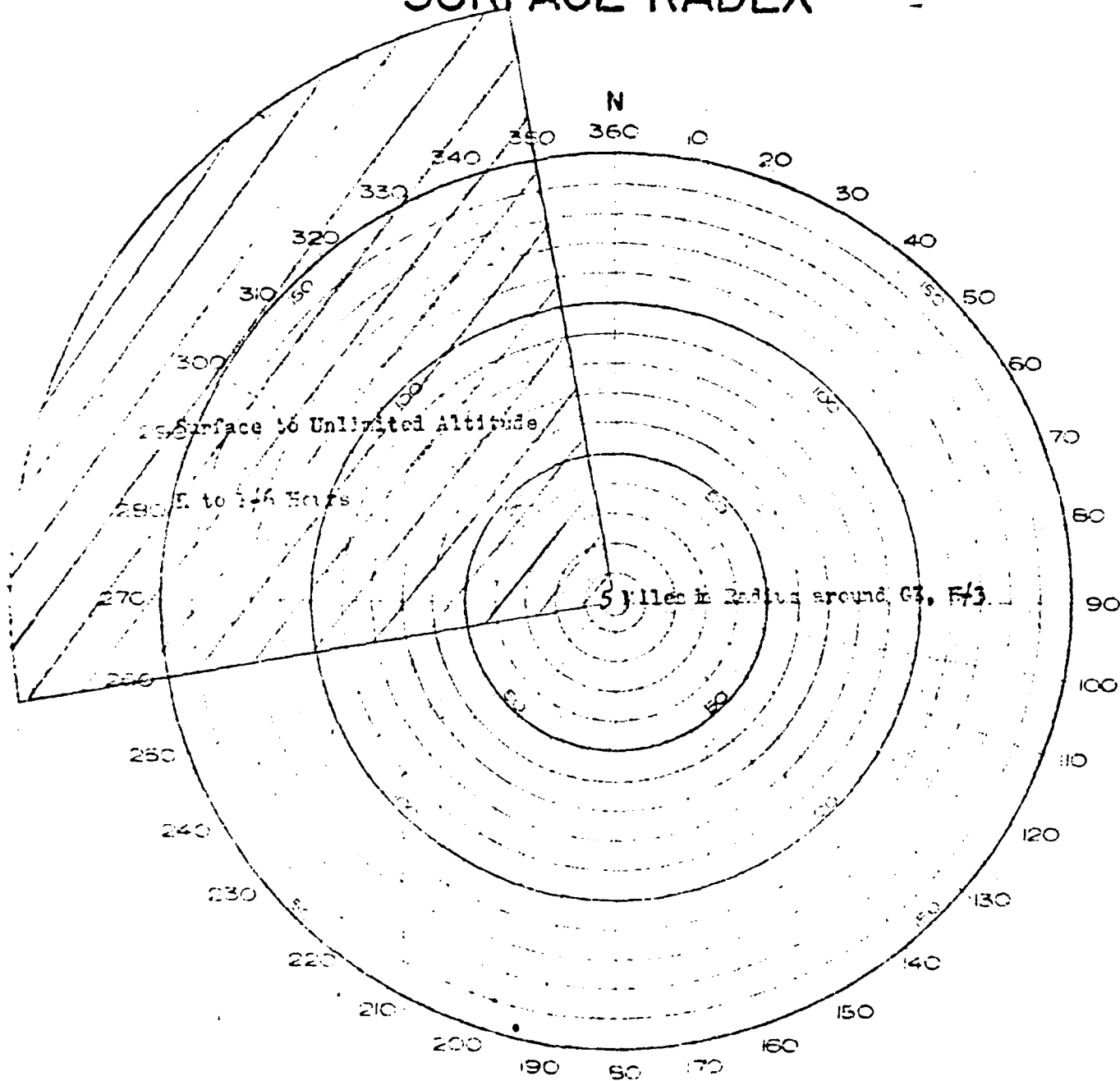
6. The actual fallout pattern lay between the radials 260 degrees and 350 degrees, which was very similar to the forecast.



LOGICOD EVENT
Forecast Rollout Plot

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



ROGWOOD EVENT

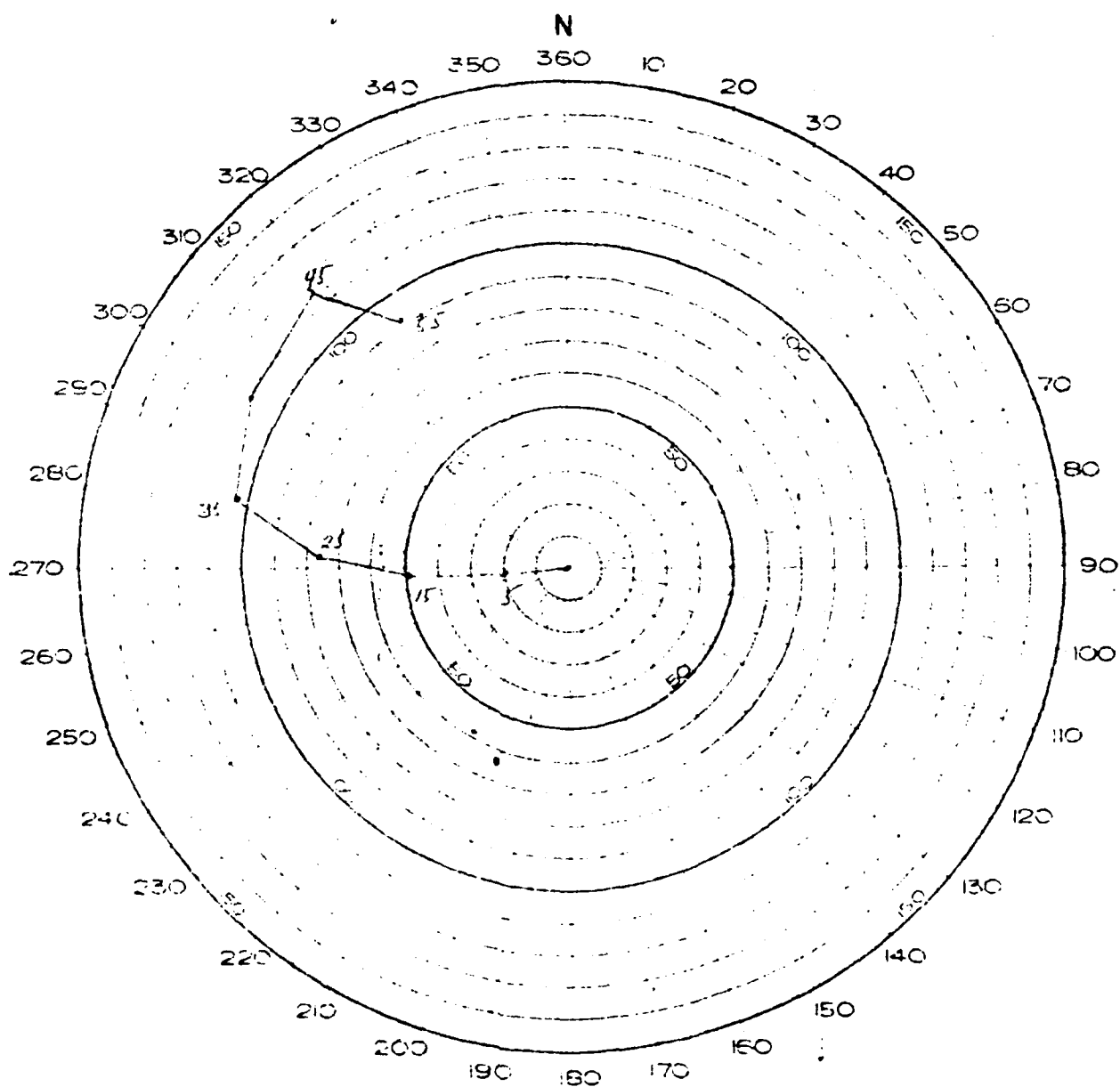
Surface and Air Index.

TAB E-1

HODOGRAPH

RESULTANT WINDS AND

SURFACE RADEX



DUG 000 0000

WIND-TIME HODOGRAPH

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

9 July 1958

DOGWOOD

ENIWETOK OBSERVED WEATHER FOR 6 JULY 1958

SURFACE WEATHER:

Sea Level Pressure	1008.9 mbs
Free Air Surface Temperature	81.3° F
Wet Bulb Temperature	77.0° F
Dew Point Temperature	77.0° F
Relative Humidity	85%
Surface Wind	080° 17 knots
Visibility	10 miles
Weather	Very light rainshowers

CLOUDS:

Scattered (5/10) cumulus bases 1,800 feet, tops unknown. Towering cumulus southwest of Eniwetok. Scattered altostratus - altocumulus (3/10), bases 12,000 feet, tops unknown. Overcast (10/10) cirriform, bases and tops unknown.

AREA WEATHER SUMMARY FROM AIRCRAFT:

Scattered (5/10) cumulus, bases 1,800 feet, tops unknown. Broken cirrus, bases 24,000 to 26,000 feet, tops 47,000 to 49,000 feet.

STATE OF THE SEA:

Open Sea: Waves from 080°, period 5 seconds, height 5 feet.
Lagoon: Waves from 080°, period 4 seconds, height 2 feet.

DOGVOOD

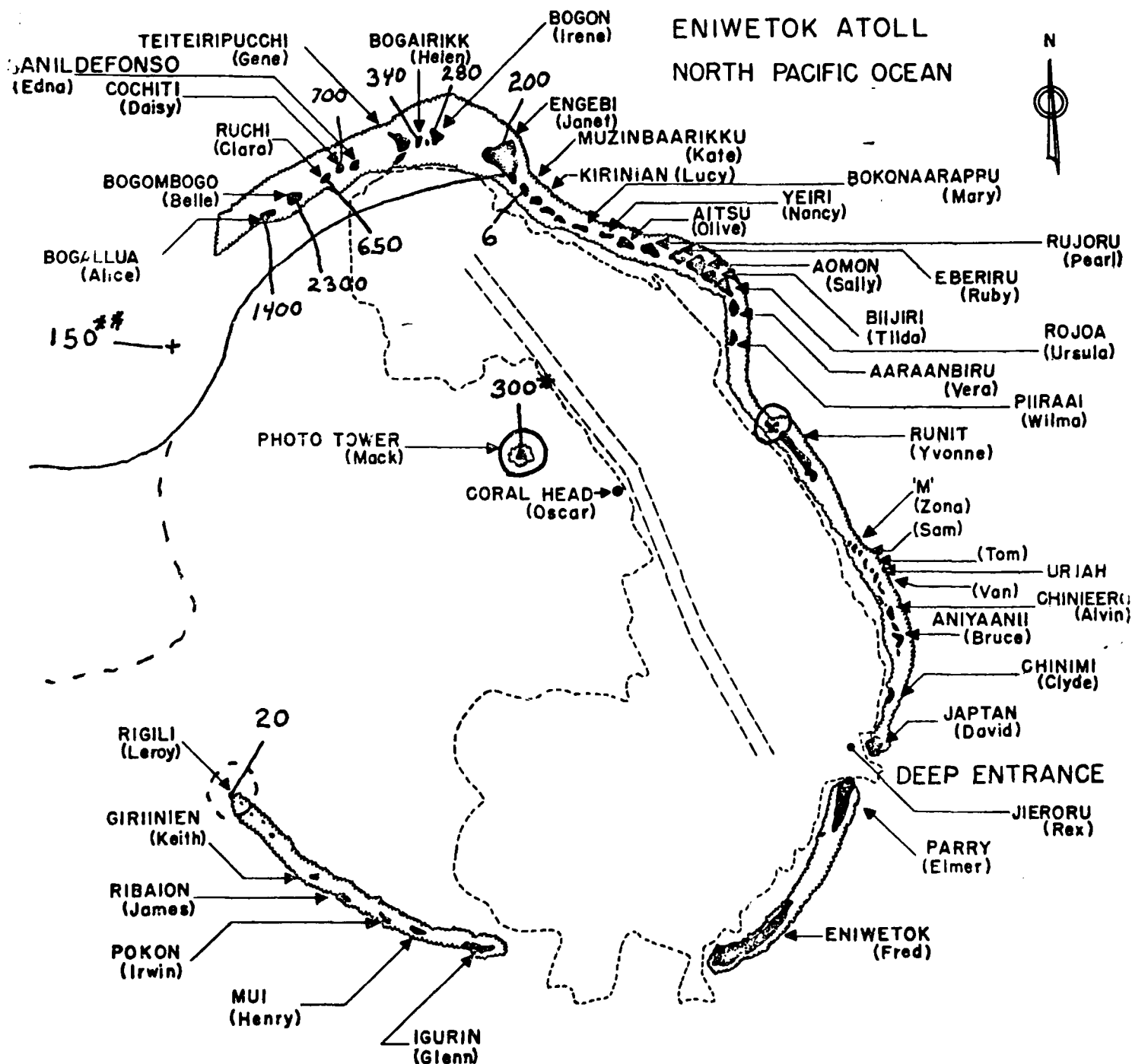
ENHETOK RADIOSONDE OBSERVATION

Pressure (Millibars)	Height (Feet)	Temperature (°C)	Dew Point (°C)
1008	Surface	28.5	23.5
1000	250	27.8	25.2
900	3,274	20.0	20.0
850	4,890	17.9	16.5
734	7,185	14.8	12.5
754	8,268	14.2	06.5
700	10,280	10.2	05.2
600	14,430	02.5	01.5
500	18,220	-04.2	-04.5
400	24,870	-15.2	-17.5
300	31,820	-30.2	-37.8
251	35,830	-40.2	-43.8
250	35,990	-40.2	Miss
200	40,860	-43.0	Miss
150	46,750	-67.2	Miss
119	51,181	-75.0	Miss
114	52,037	-73.0	Miss
100	54,580	-73.8	Miss
099	54,757	-77.0	Miss
096	55,249	-77.0	Miss
090	56,627	-72.0	Miss
083	58,169	-73.0	Miss
064	63,222	-64.0	Miss
050	68,230	-62.5	Miss
045	70,374	-60.0	Miss
030	78,634	61.0 -56.2	Miss

DOGWOOD

ENVIATOK WINDS ALOFT OBSERVATION

Height (Feet)	Direction (Degrees)	Velocity (Knots)
Surface	080	18 16
1,000	080	17
2,000	080	21
3,000	080	22
4,000	080	21
5,000	080	17
6,000	080	15
7,000	080	17
8,000	080	15
9,000	070	15 16
10,000	080	17
12,000	100	14
14,000	100	12
16,000	100	18
18,000	100	19
20,000	100	12 16
22,000	100	10
24,000	100	10
26,000	100	12
28,000	120	16
30,000	120	18
32,000	120	18
34,000	120	14
36,000	140	20
38,000	150	23
40,000	190	33
42,500	200	33
45,000	210	35
47,500	250	33
50,000	280	13
52,500	290	11
55,000	290	15
57,500	010	19
60,000	030	09
65,000	050	13
70,000	050	33
75,000	050	35
78,000	040	43



ALL READINGS IN
 MR/HR, GROUND LEVEL,
 AS OF 1400, 6 JULY, 1958
 * 1045 HRS., 6 JULY, 1958
 ** AT 200' ALT.

Radiological Surface Survey, H+8 Hours

INDEX

TAB

A--Summary, POPLAR Event, Operation HARDTACK

B--Forecast Fallicut Plot

C--Trajectory Plot

D--Surface and Air Radar

E--1. Forecast Hodograph

2. Shot-time Hodograph

3. Weather Summary

F--1. Radiological Surface Survey, H+15 Hours

2. Radiological Surface Survey, D+1 Day

POPLAR EVENT
OPERATION HARDTACK

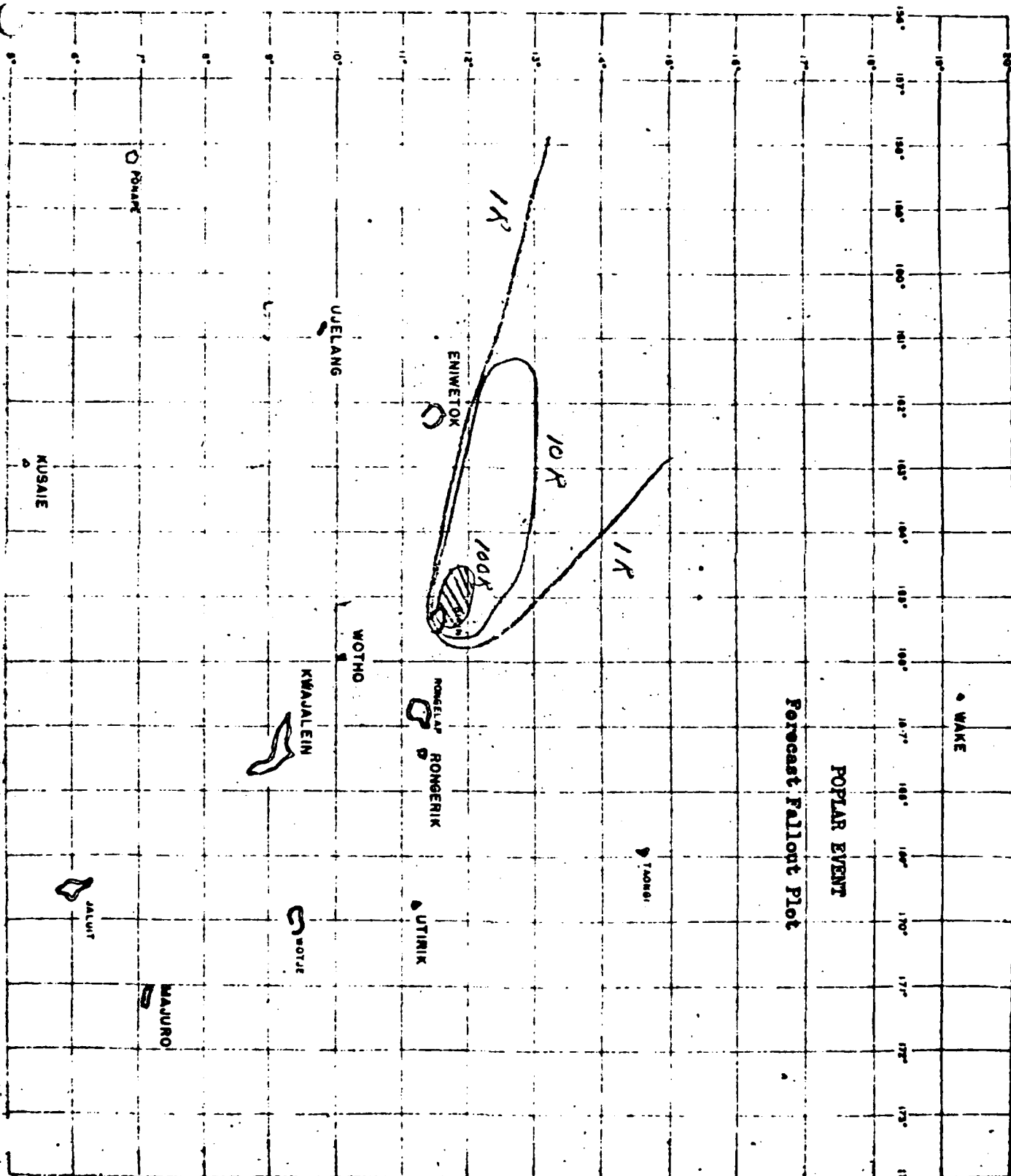
1. The POPLAR device was detonated on a barge off Namu Island (Charlie), Bikini Atoll, at 1520M, 12 July 1958. RadSafe operations were conducted from the USS Benner, approximately ten miles south of Nam Island. The cloud rose immediately above the radar limits of 61,000 feet, and the cloud base was established at 42,000 feet at 1540M. [REDACTED]

2. The P2V aircraft (Wildroot #11) reported over How at 1650M, and it was vectored between How and Oboe. Only background was recorded, and the P2V was sent out on bearings of 260 degrees from Oboe for forty miles. The high reading was obtained thirty miles out: 100 mr/hr, at 1700M. At 1745M the island chain with the exception of the ground zero area was flown at 3,000 feet. Dog read 45 mr/hr. Communications difficulties developed, and a second P2V was scrambled.

3. Re-entry hour was declared at 1945M, and the second P2V was vectored on a northerly and westerly bearing until midnight.

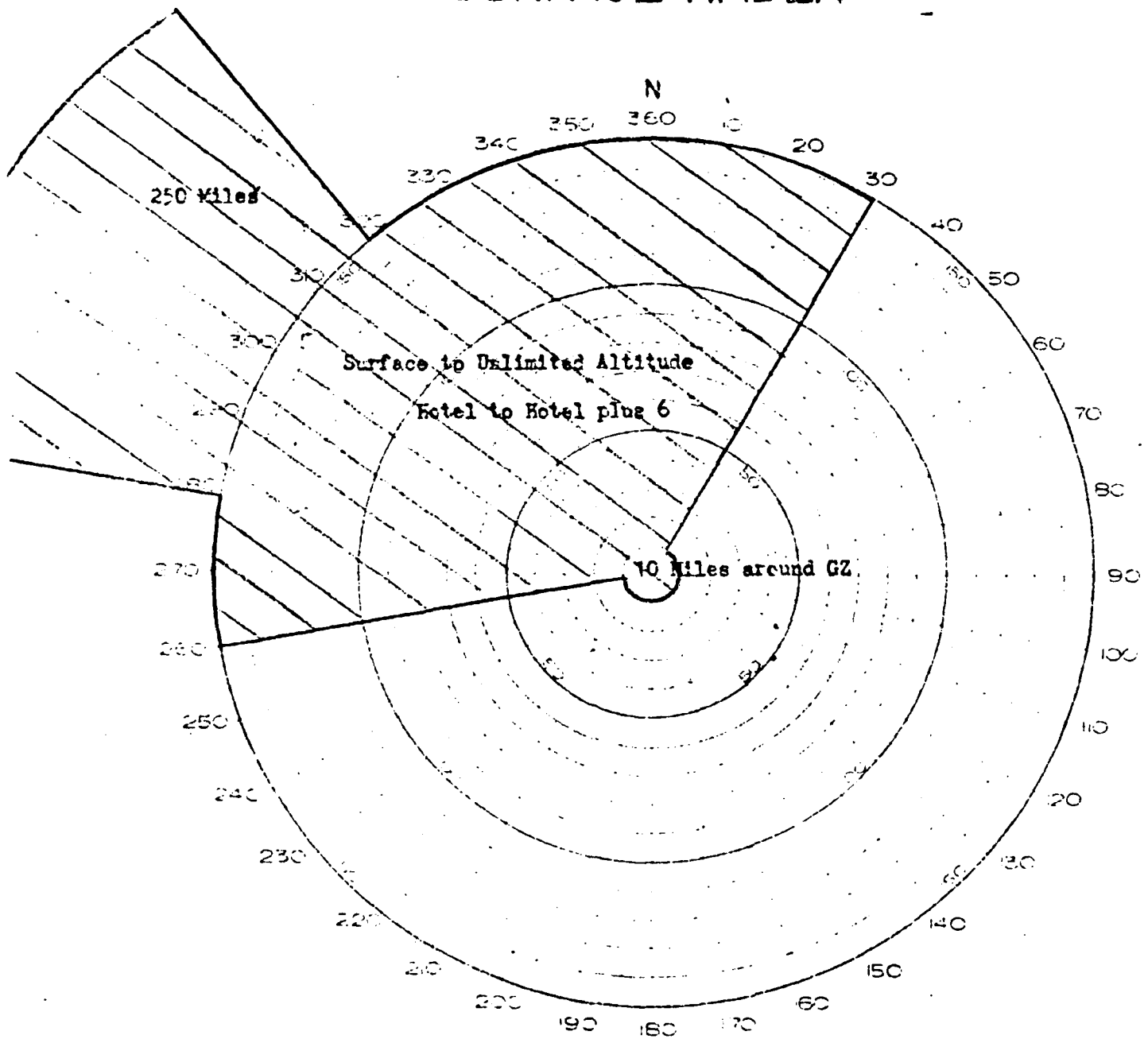
4. Initial helicopter surveys took off at 0700M and 0745M, 13 July. No significant readings were obtained. A detailed survey was made at 1500M the same afternoon.

5. Two problems affected the success of this operation. Communications difficulties later proved to have been with the Benner and not the P2V. The second P2V was then controlled through Eniwetok AOC. Difficulty with Benner radar made it impossible to obtain current wind data from Bikini.



HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



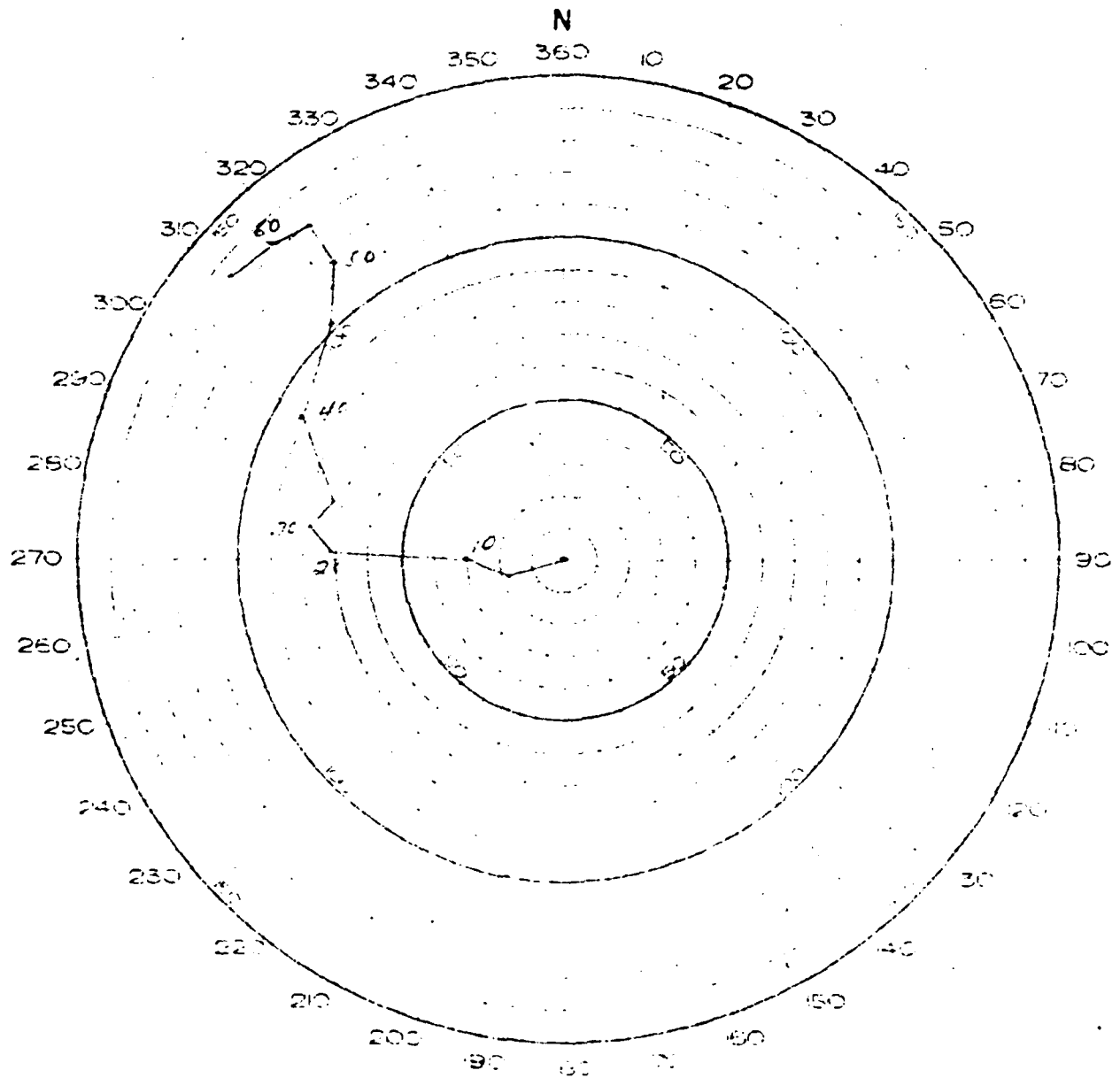
POPLAR EVENT

Surface and Air Radex

TAE D

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX

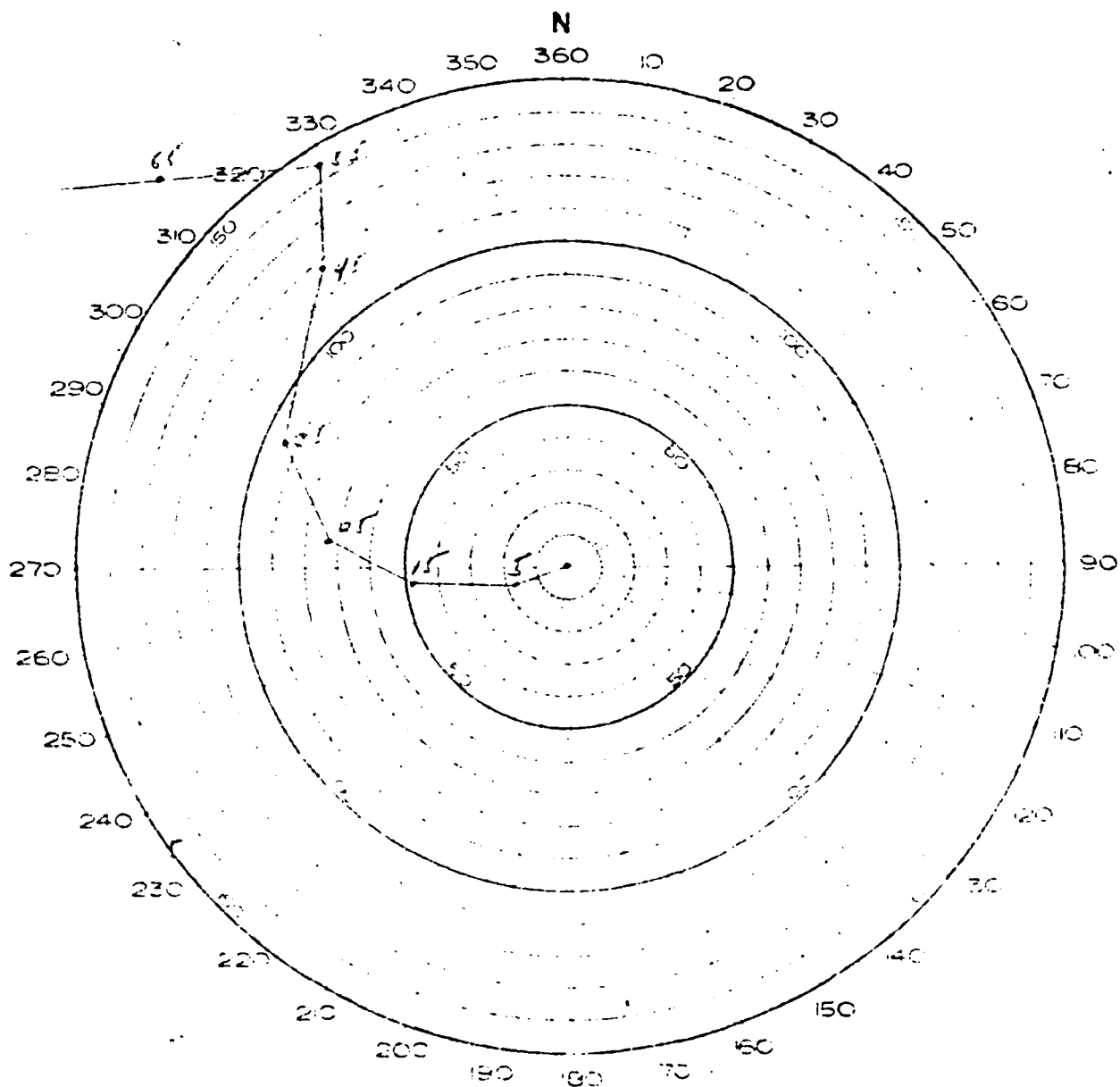


POPLAR EVENT
Forecast Hodograph

TAB E-1

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



POPLAR EVENT

Shot-time Hodograph

TAE E-2

REF ID: A66515

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

14 July 1958

POPLAR

BIKINI OBSERVED WEATHER FOR 12 JULY 1958

SURFACE WEATHER:

Sea Level Pressure	1008.1 mbs
Free Air Surface Temperature	82.3° F
Wet Bulb Temperature	82.0° F
Dew Point Temperature	81.9° F
Relative Humidity	99%
Surface Wind	070° 11 knots
Visibility	10 miles lowering to 7 miles
Weather	Rainshowers

CLOUDS:

Overcast (10/10) cumulus and fractocumulus, bases 1,500 feet, tops unknown. Higher overcast visible, bases and tops unknown.

AREA WEATHER SUMMARY FROM AIRCRAFT:

Scattered to broken (5/10 to 9/10) cumulus, bases variable 1,500 to 3,000 feet, tops generally 8,000 to 9,000 feet. Scattered tops east and south, 35,000 feet. Multiple layers of cirriform bases 30,000 to 49,000 feet, tops unknown.

Scattered rainshowers, east and south.

STATE OF THE SEA:

Open Sea: Waves from 080, period 4 - 5 seconds, height 3 - 5 feet.
Lagoon: Waves from 080, period 3 - 4 seconds, height 2 feet.

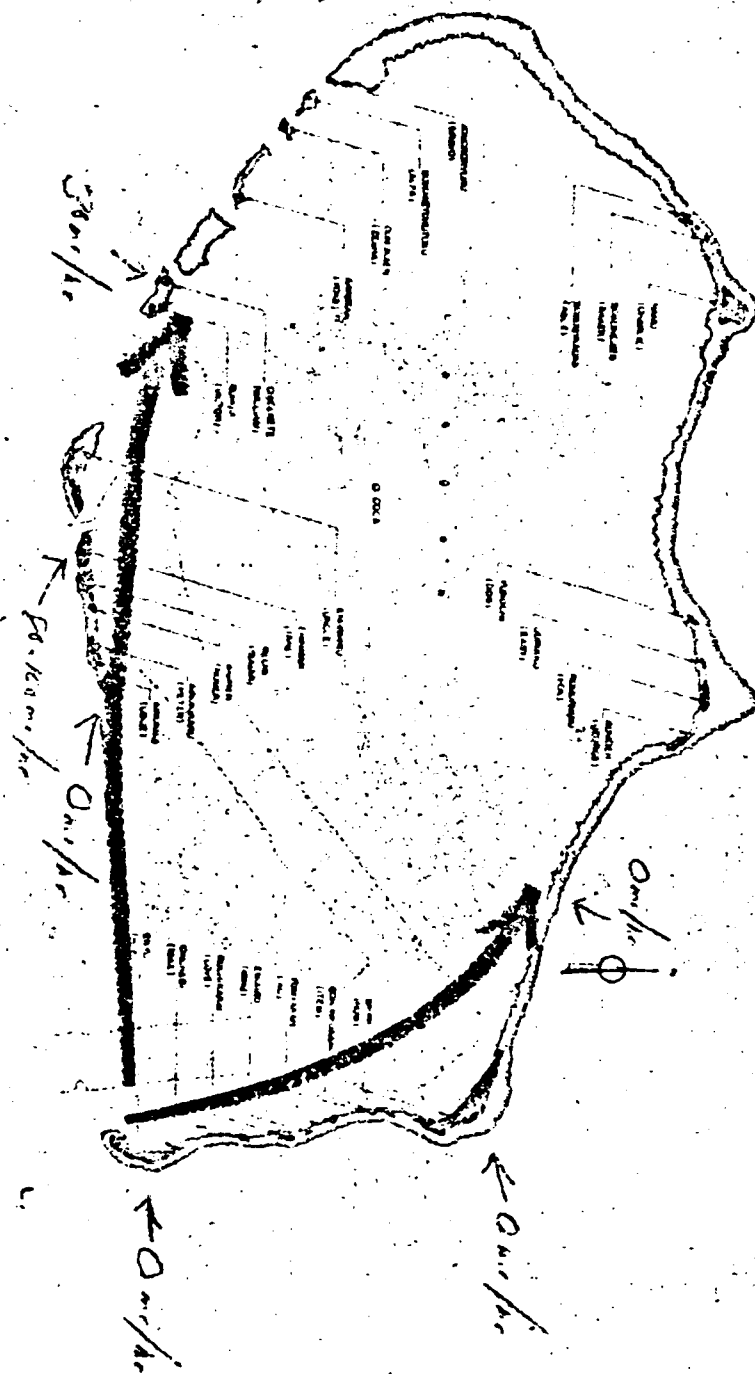
FOPLARBIKINI RADIOSONDE OBSERVATION

<u>Pressure</u> <u>(Millibars)</u>	<u>Height</u> <u>(Feet)</u>	<u>Temperature</u> <u>(°C)</u>	<u>Dew Point</u> <u>(°C)</u>
1010	Surface	28.2	23.5
1000	300	27.2	23.2
952	1,706	23.5	21.5
850	4,950	18.2	15.2
700	10,340	09.2	04.5
612	14,042	02.5	-03.2
600	14,490	01.8	-03.2
560	16,404	-01.2	-03.2
500	19,250	-05.5	-07.5
400	24,900	-14.8	-19.2
309	31,102	-28.5	-33.5
300	31,820	-30.2	-37.2
256	34,383	-37.5	-48.2
250	35,970	-41.0	Miss
200	40,810	-53.2	Miss
175	43,583	-61.0	Miss
150	46,780	Miss	Miss

POPLAR

BIKINI WINDS ALOFT OBSERVATION

<u>Height</u> <u>(Feet)</u>	<u>Direction</u> <u>(Degrees)</u>	<u>Velocity</u> <u>(Knots)</u>
Surface	090	10
1,000	070	18
2,000	070	17
3,000	070	18
4,000	070	18
5,000	070	17
6,000	070	16
7,000	080	15
8,000	090	15
9,000	100	18
10,000	100	18
12,000	110	19
14,000	110	18
16,000	110	13
18,000	130	12
20,000	140	10
23,000	030	05
25,000	050	10
30,000	180	09
35,000	170	21
40,000	180	26
45,000	230	34
50,000	200	23
55,000	150	11
60,000	080	27
65,000	090	22
70,000	090	36
75,000	080	62
80,000	090	59
83,000	080	61

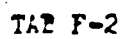


MAP OF BIKINI ATOLL

Initial Helicopter Survey
130700M July

FOPLAR EVENT

Second Helicopter Survey, H+28 Hours



INDEX

TAB

A--Summary, SCAEVOLA Event, Operation HARDTACK -

B--Forecast Fallout Plot

C--Surface and Air Radex

D--Shot-line Hodgograph

E--Weather Summary

SCAEVOIA EVENT

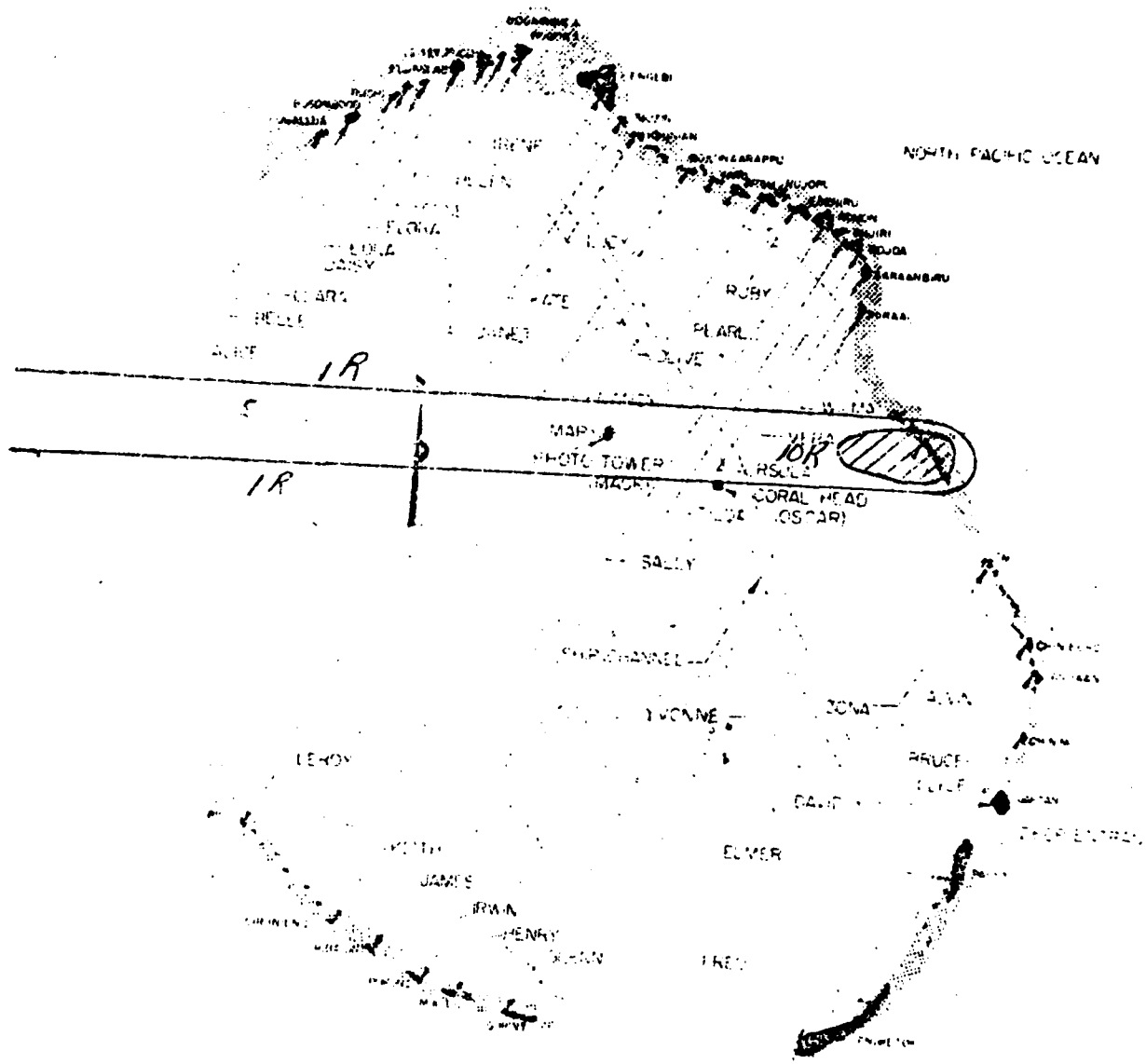
OPERATION HARDTACK

1. The SCAEVOIA device was detonated 500 feet off the west side of Fanning Island, ~~Eniwetok~~ Atoll, at 1600M on 14 July 1958. The cloud rose to 1,500 feet.

2. The P2V aircraft were not employed, but a survey helicopter took off from Bruce at 1640M. A reading of 20 to 30 m/hr was taken over the shot target.

3. Re-entry hour was declared at 1700M, and the radar was cancelled.

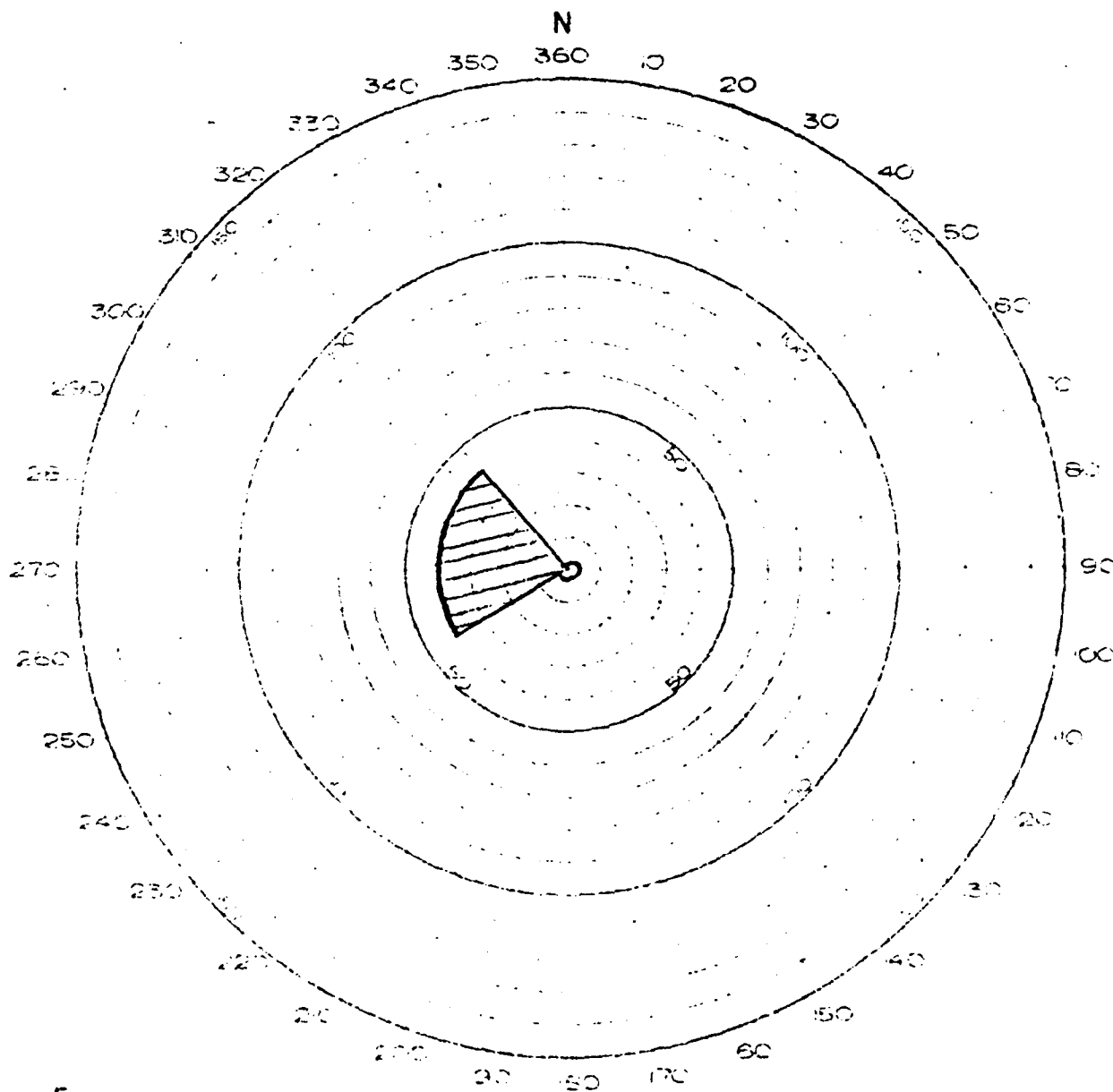
4. It is estimated that no appreciable fallout existed outside the area immediately adjacent to ground zero.



SCAEVOLA EVENT
Forecast Fallout Plot

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



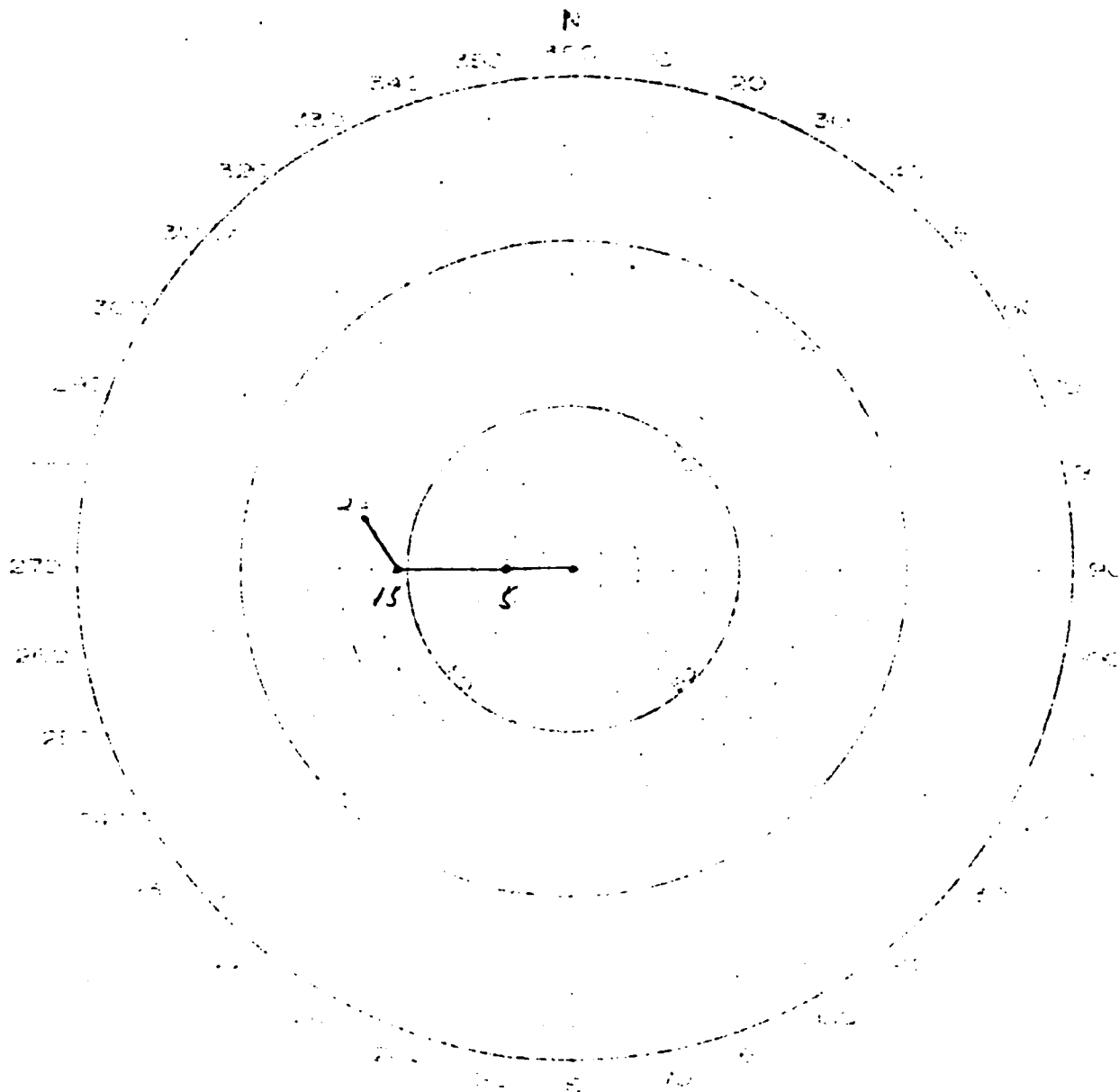
SCAEVOLA EVENT

Surface and Air Radex

TAP C

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



SCAEVOLA EVENT

Shot-vine Hodograph.

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

15 July 1958

ENI/ETOK OBSERVED WEATHER FOR 14 JULY 1958

SCAEVOLA

SURFACE WEATHER:

Sea Level Pressure	1008.5 mbs
Free Air Surface Temperature	86.2° F
Wet Bulb Temperature	79.4° F
Dew Point Temperature	77.0° F
Relative Humidity	74%
Surface Wind	090° 14 knots
Visibility	10 miles
Weather	None

CLOUDS:

Scattered (3/10) cumulus with towering cumulus, bases 1,300 feet, tops unknown. Scattered (2/10) cumulus, bases 4,000 feet, tops unknown. Scattered altocumulus - altostratus (4/10) bases 10,000 feet, tops unknown.

AREA WEATHER SUMMARY FROM AIRCRAFT:

Scattered (3/10 - 4/10) cumulus, bases 1,500 feet, tops 3,000 to 4,000 feet, scattered tops to 13,000 feet. Scattered cirriform, bases and tops unknown.

STATE OF THE SEA:

Open Sea: Waves from 090°, period 4 seconds, height 3 feet.
Lagoon: Waves from 090°, period 3 seconds, height 1 foot.

INDEX

TAB

A--Summary, PISONIA Event, Operation HARDTACK

B--Forecast Fallout Plot

C--Trajectory Plot

D--Surface and Air Radar

E--1. Forecast Hodegraph

2. Shot-time Hodegraph

3. Weather Summary

F--Radiological Surface Survey, H+20 Hours

PISCANIA EVENT
OPERATION HARDACK

1. The PISCANIA device was detonated on a barge off Yvonne Island, Eniwetok Atoll, at 1100M, 18 July 1958. [REDACTED]

[REDACTED] and the cloud rose to 55,000 feet immediately.

2. The P2V aircraft (Wildcat #10) was vectored on a line from Keith to Bruce and then gradually across the upper portion of the lagoon on radials from Alvin. Heavy rain showers caused isolated readings of 5 r/hr, 6 r/hr, and 7 r/hr throughout the area adjacent to ground zero. Readings attenuated quickly, but it was difficult to obtain a picture of the situation for several hours. The P2V was placed on a barrier patrol on radials of 240 degrees and 250 degrees for 75 miles from Eniwetok. A final clearing run was made to Ujelang, and the P2V was released at 1845M.

3. Weather prevented utilization of helicopter survey aircraft. Two M-boats were dispatched at 1415M. One turned back at Yvonne because of hot water, and the other read 1 r/hr at the Mack photo tower. Both returned at 1800M. A helicopter survey was made the following morning, from 0700M to 0900M, and readings of 1 mr/hr were made on Yvonne and Wilma.

4. It is estimated that the fallout fell along a bearing of 270 degrees for approximately 250 miles. Local radiation level on Elmer rose to a peak of 30 mr/hr suddenly, at 1448M, in heavy rain. Intensity quickly

dropped and returned to background level at 1730M. No increases were reported on the off-atoll sites.

5. Weather was a contributing factor which hampered an otherwise smooth operation.

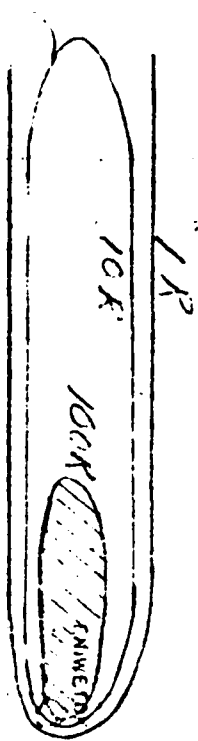
TAB A

WAKE

10° 20° 30° 40° 50° 60° 70° 80° 90° 100° 110° 120° 130° 140° 150° 160° 170° 180°

FISONIA EVERT

Forecast Falldout Plot



1K

100K

100K

HONGENIX

UTIRIX

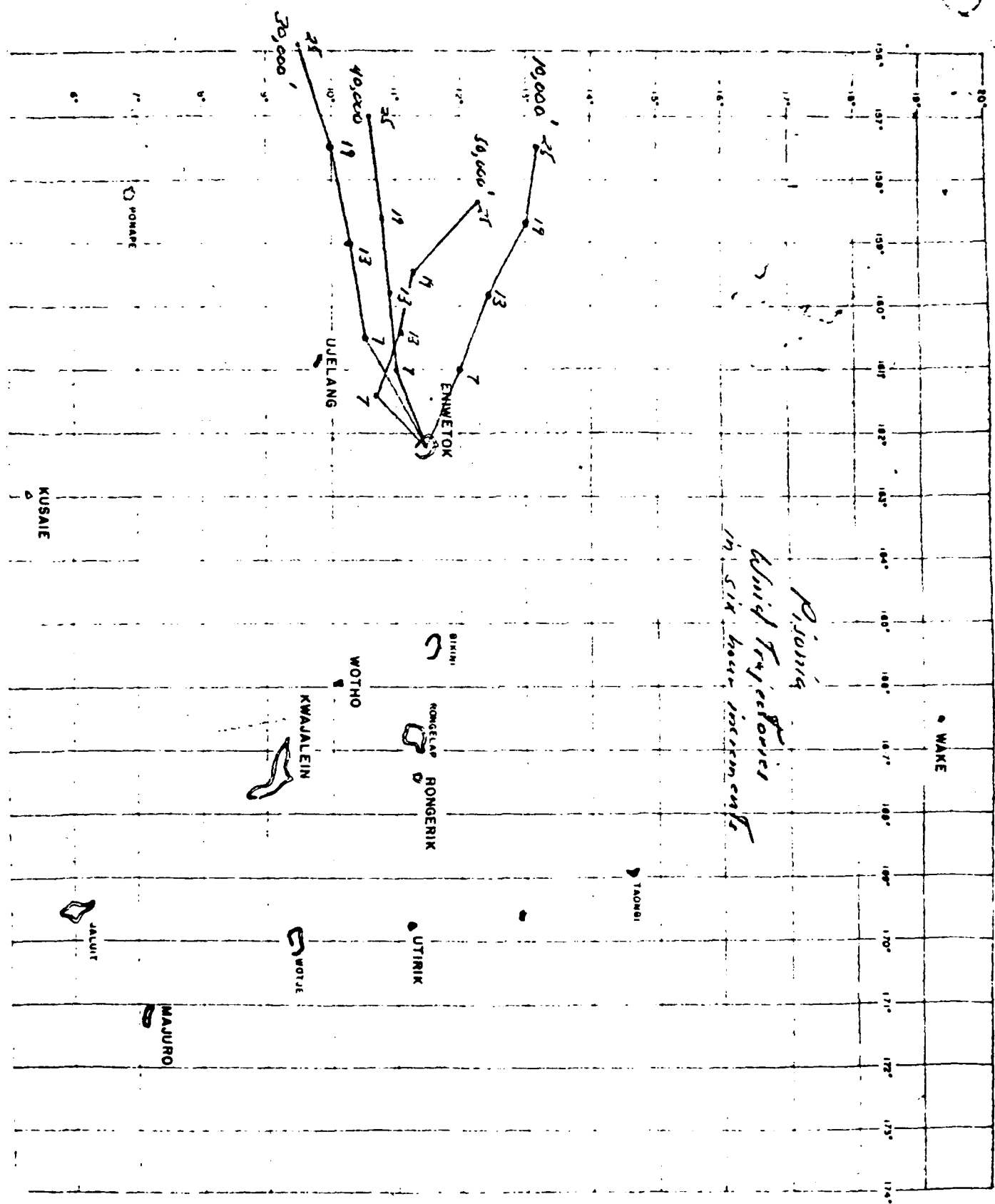
WOTHO

KWAJALEIN

MAURO

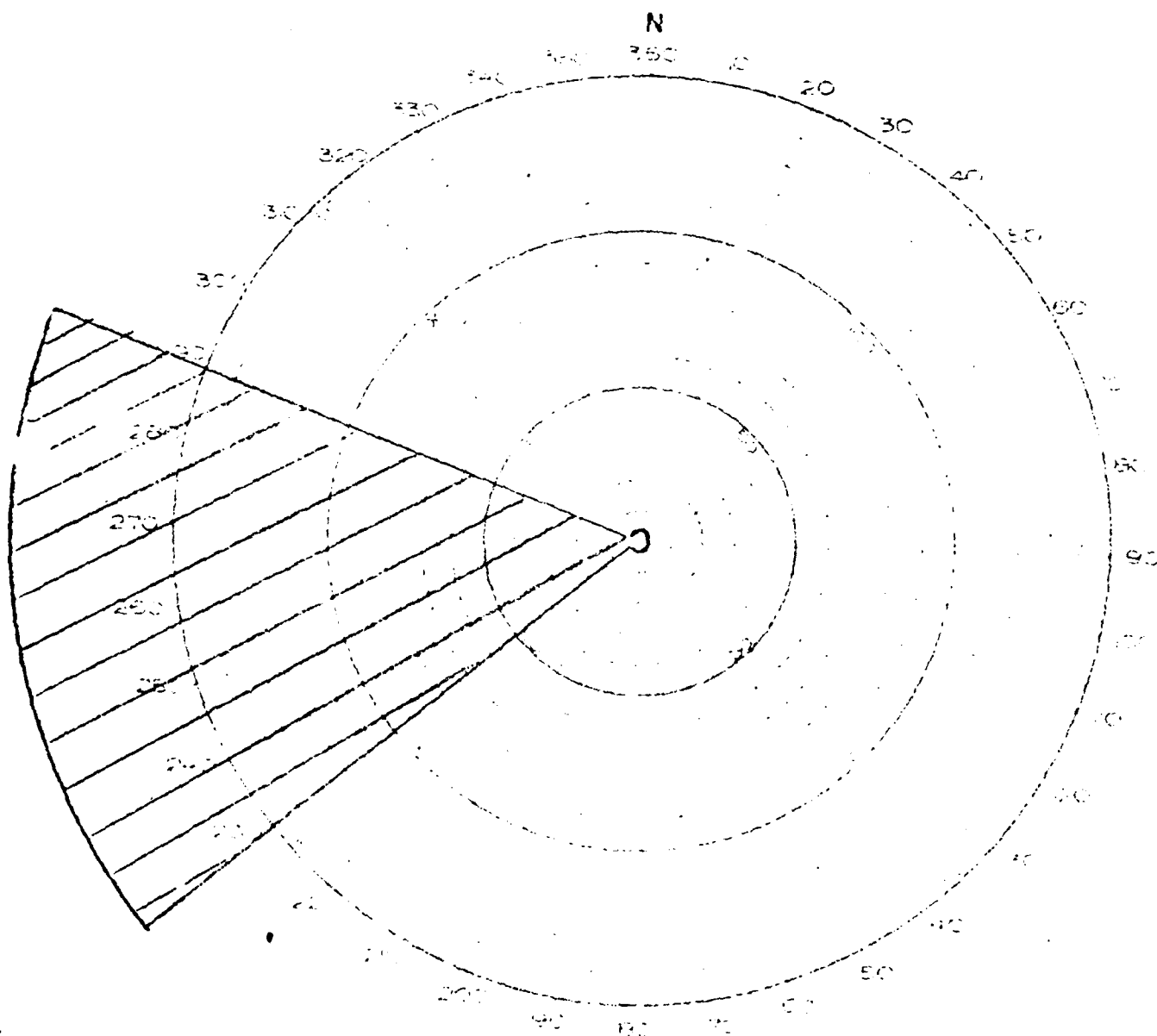
MAURO

KUSAIE



*Pacific
Wind Transporter
in six hour increments*

HODOGRAPH RESULTANT WINDS AND SURFACE RADEX

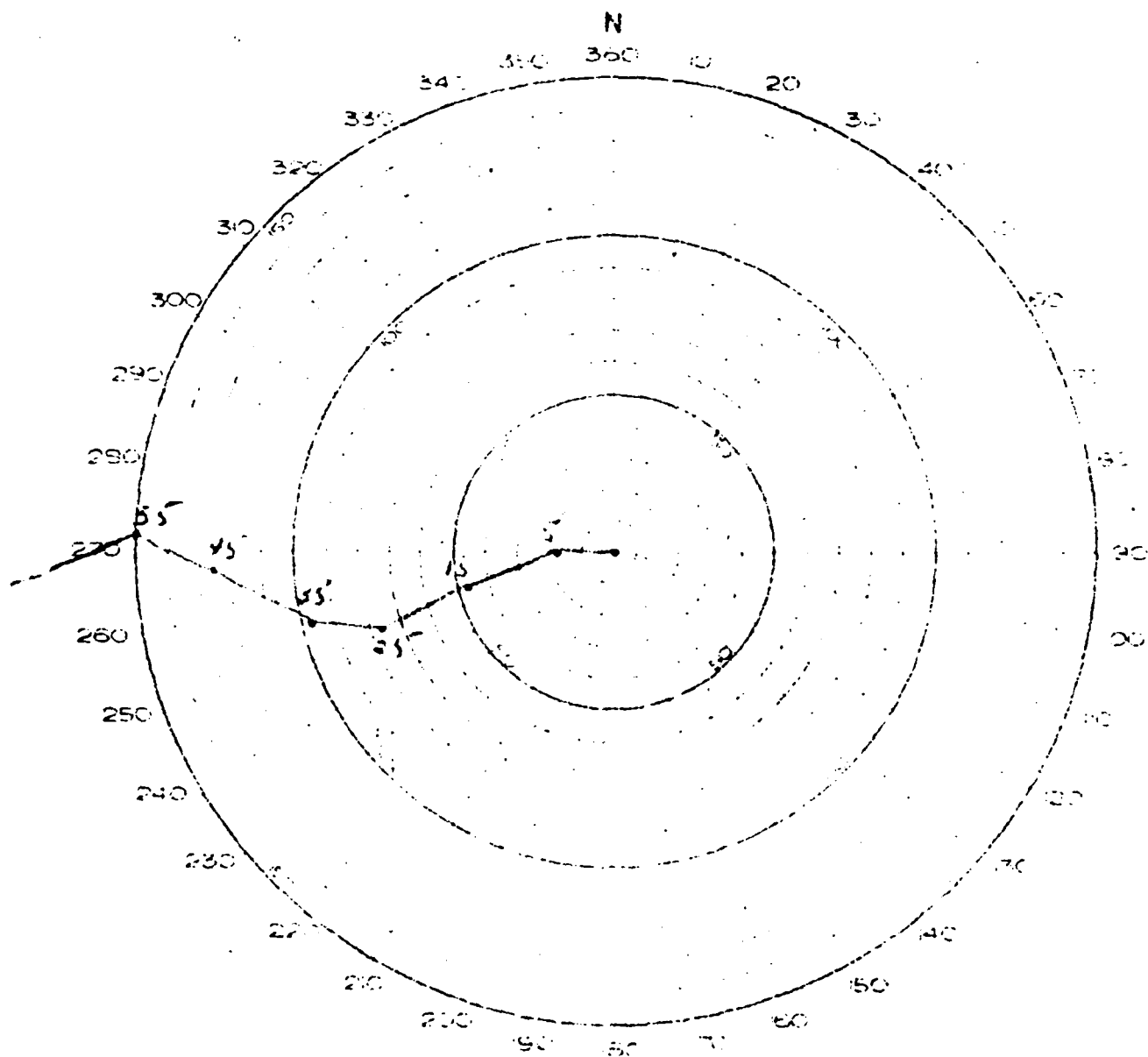


FISCHIA EVENT
Surface and Air Radex
TAP D

HODOGRAPH

RESULTANT WINDS AND

SURFACE RADEX



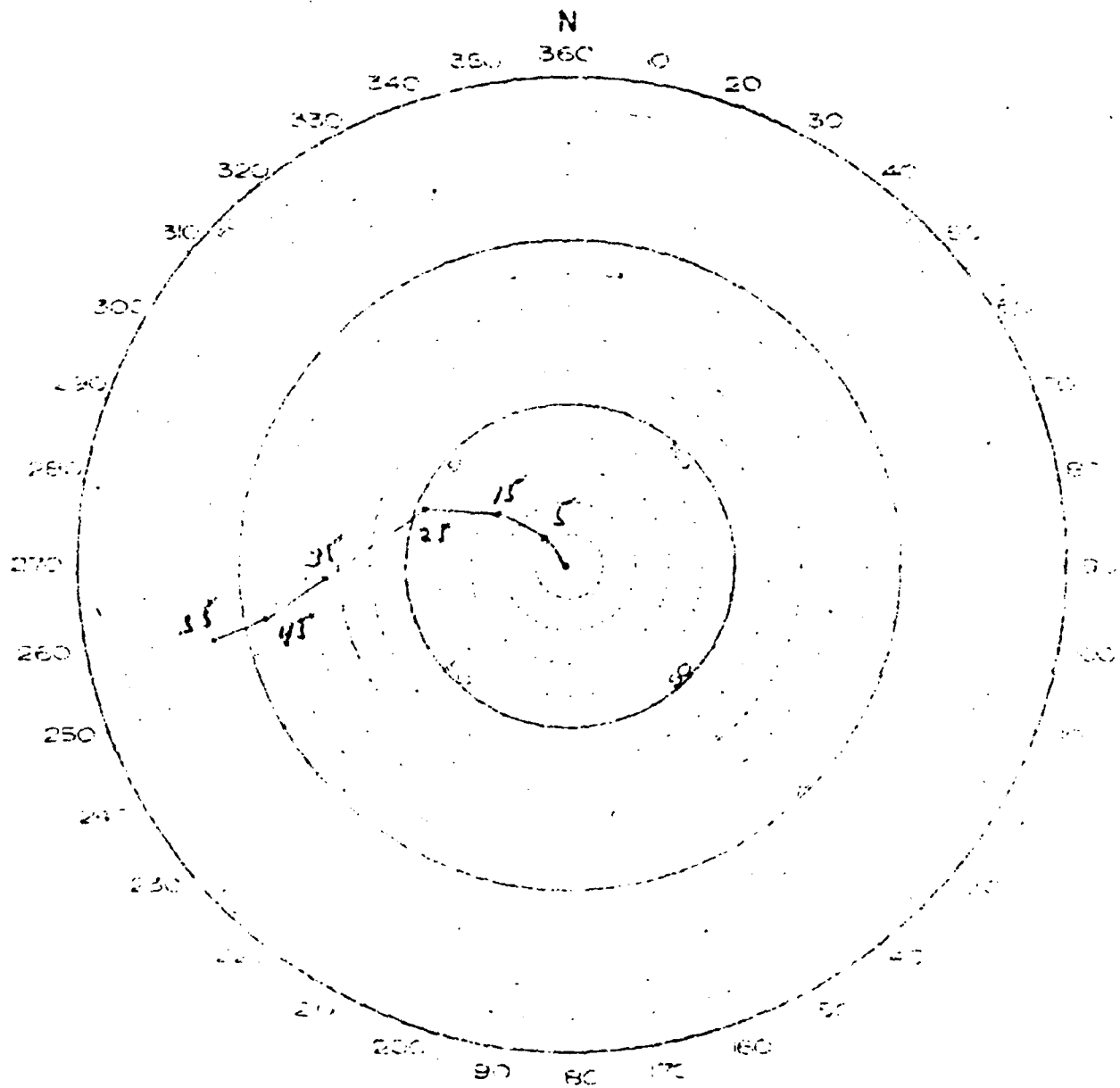
FIJONIA EVENT

Forecast Hodograph

TAB E-1

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



PISONIA EVENT

Shot-time Hodograph

106

TAB E-2

RADAR

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

19 July 1958

PISONIA

ENIWETOK OBSERVED WEATHER FOR 18 JULY 1958

SURFACE WEATHER:

Sea Level Pressure	1011.5 mbs
Free Air Surface Temperature	80.3° F
Wet Bulb Temperature	76.4° F
Dew Point Temperature	74.9° F
Relative Humidity	83%
Surface Wind	020° 4 knots shifting to 200° 7 knots
Visibility	4 miles lowering to 1 mile
Weather	Moderate rainshowers

CLOUDS:

Broken (9/10) cumulus becoming overcast (10/10) cumulus, bases 1,500 feet, tops unknown. Broken (6/10) cirriform, bases and tops unknown.

AREA WEATHER SUMMARY FROM AIRCRAFT:

Broken cumulus (5/10), bases unknown, tops unknown with scattered tops above 50,000 feet. Scattered (5/10) to broken (7/10) cirriform, bases 40,000 feet, tops 47,000 feet. Some cirriform, very thin.

STATE OF THE SEA:

Open Sea: Waves 3 - 4 feet high, period 4 - 5 seconds, length 50 - 80 feet.

Lagoon: Waves 1 foot high, period 2 - 3 seconds.

PISONIA

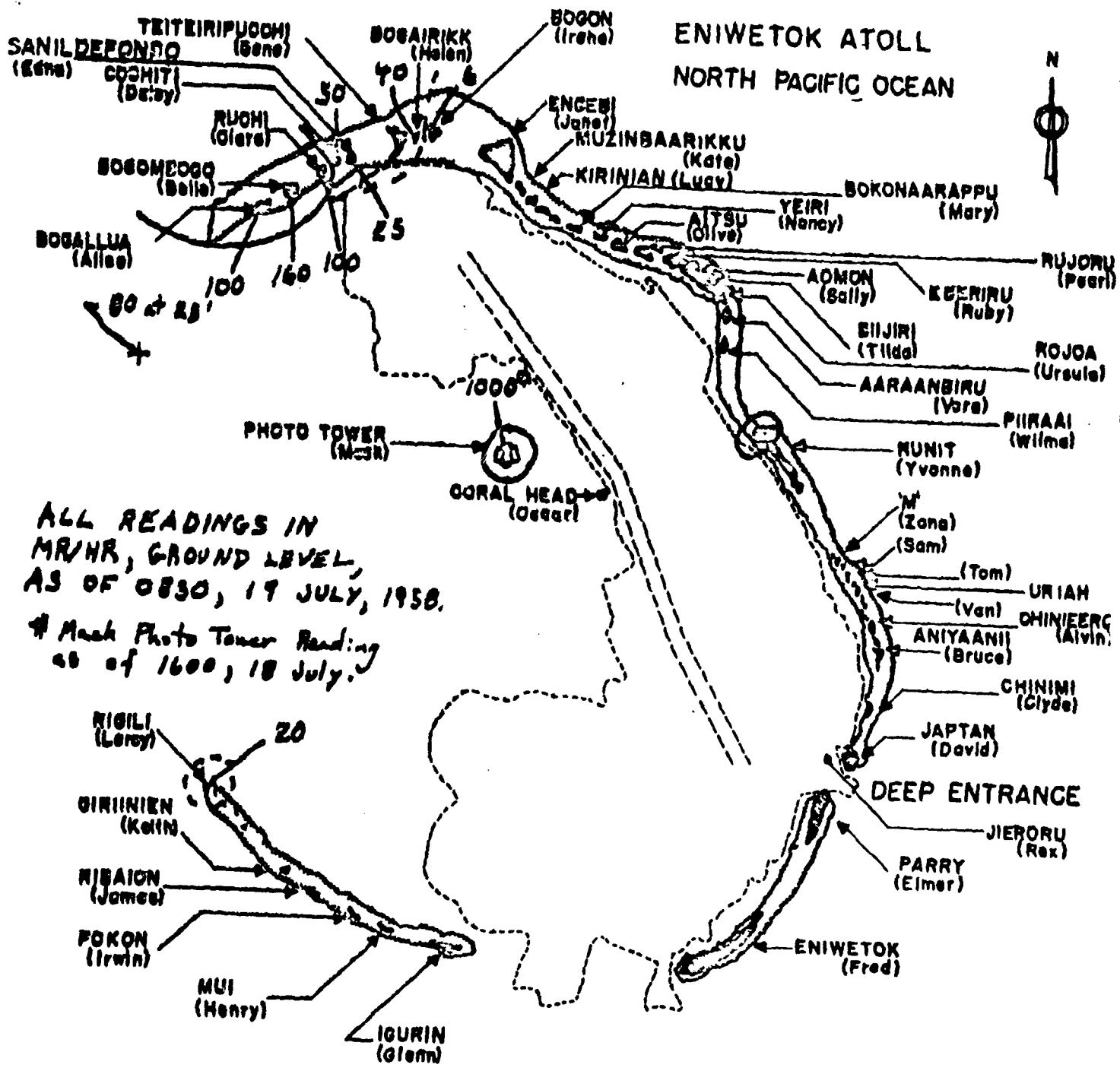
ENDUETOK RADIOSONDE OBSERVATION

<u>Pressure</u> <u>(Millibars)</u>	<u>Height</u> <u>(Feet)</u>	<u>Temperature</u> <u>(°C)</u>	<u>Dew Point</u> <u>(°C)</u>
1011	Surface	27.5	24.2
1000	340	26.8	26.8
940	2,100	24.8	24.8
883	3,871	19.4	Miss
850	4,970	18.8	Miss
784	7,218	Miss	Miss
700	10,340	09.7	Miss
696	10,466	09.5	Miss
600	14,480	03.0	Miss
587	15,059	02.0	Miss
500	19,210	-10.0	Miss
480	20,243	-12.8	-28.2
451	21,818	-11.0	Miss
400	24,800	-16.4	Miss
300	31,690	-32.4	Miss
250	35,820	-42.2	Miss
200	40,680	-53.7	Miss
150	46,550	-68.6	Miss
123	50,525	-76.0	Miss
118	51,312	-74.0	Miss
100	54,310	-76.2	Miss
097	54,954	-77.0	Miss
087	57,086	-77.0	Miss
074	60,138	-70.0	Miss
050	67,860	-62.5	Miss
044	70,538	-63.0	Miss
025	72,230	-50.8	Miss

PISCANIA

ENRIETOK WINDS ALOFT OBSERVATION

<u>Height</u> <u>(Feet)</u>	<u>Direction</u> <u>(Degrees)</u>	<u>Velocity</u> <u>(Knots)</u>
Surface	Calm	Calm
1,000	180	08
2,000	170	09
3,000	160	12
4,000	140	15
5,000	130	12
6,000	130	10
7,000	130	12
8,000	120	09
9,000	120	07
10,000	120	11
12,000	110	10
14,000	100	08
16,000	090	06
18,000	120	15
20,000	120	12
23,000	080	16
24,000	070	14
25,000	070	13
26,000	080	12
28,000	070	18
30,000	060	19
32,000	050	18
34,000	050	19
35,000	050	18
36,000	050	17
38,000	070	14
40,000	070	08
42,500	050	12
45,000	040	17
47,500	040	14
50,000	050	10
52,500	080	10
55,000	100	10
57,500	110	18
60,000	100	19
65,000	090	27
70,000	090	45
75,000	090	48
80,000	090	58
85,000	100	59
90,000	090	71
95,000	090	65
100,000	090	86
105,000	090	88
109,000	100	89



ALL READINGS IN
MR/HR, GROUND LEVEL,
AS OF 0830, 19 JULY, 1958.

* Mach Photo Tower Reading
as of 1600, 18 July.

PISONIA EVENT
Radiological Surface Survey, H+20 Hours

----- LIMITED RADEX
----- FULL RADEX

INDEX

TAE

A--Summary, JUNIPER Event, Operation HARDTACK

1--Forecast Fallout Plot

2--Trajectory Plot

3--Surface and Air Radar

4--1. Forecast Radiograph

2. Shot-time Radiograph

3. Weather Summary

5--Radiological Surface Survey, H+3 Hours

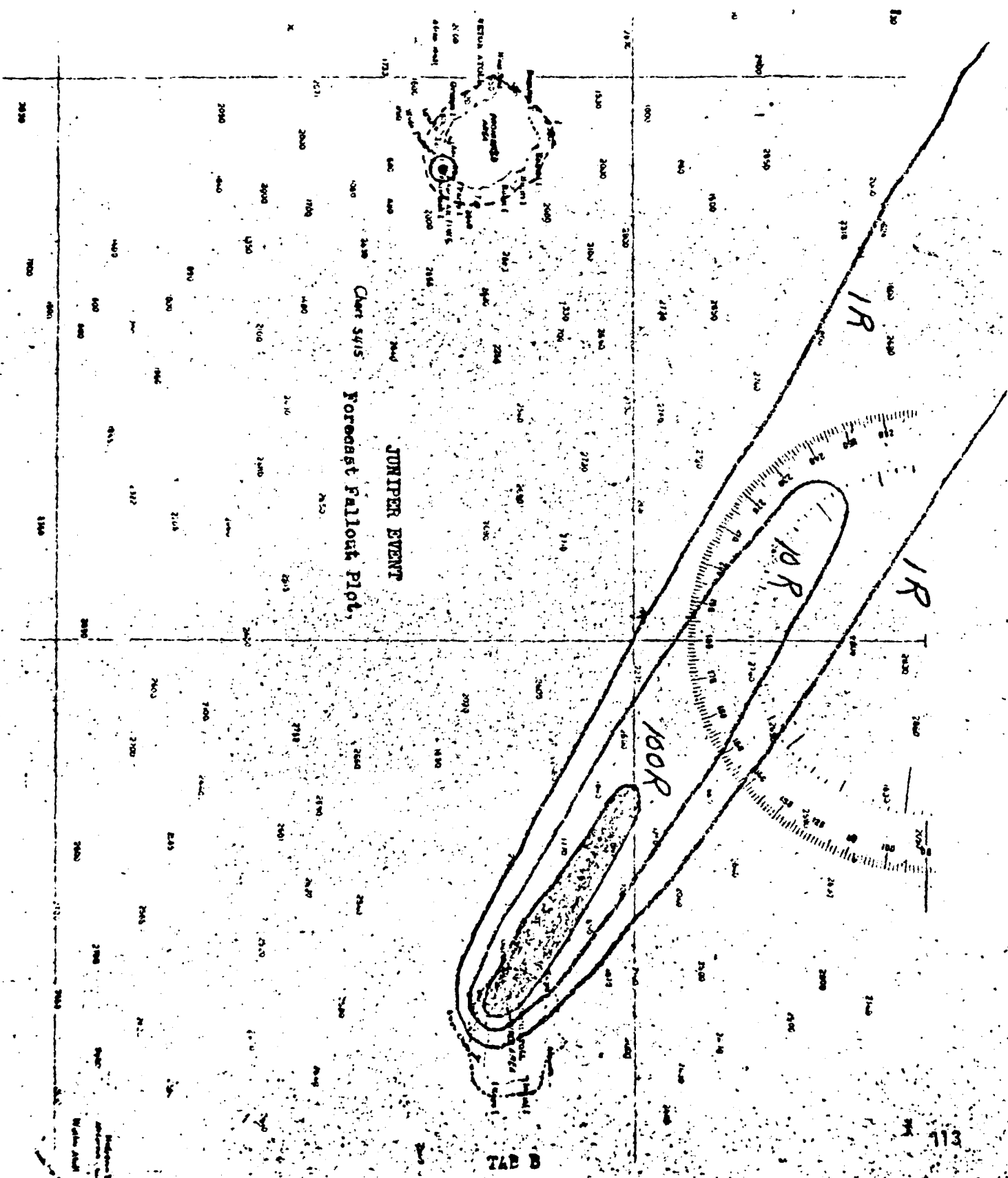
JUNIPER EVENT
OPERATION HARDTACK

1. The JUNIPER device was detonated on a barge to the west of Tare Island, Bikini Atoll, at 1620M, 22 July 1958. The cloud rose immediately to 40,000 feet with a base estimated at 24,000 feet.

2. The P2V aircraft (Wildcat #4) reported over Nam at 1650M, and it was vectored to How, to Dog, to Peter with only background readings reported. Some hot spots were encountered in the vicinity of ground zero, the highest being 32 mr/hr at 1720M. The P2V was vectored on a westerly bearing as a barrier patrol.

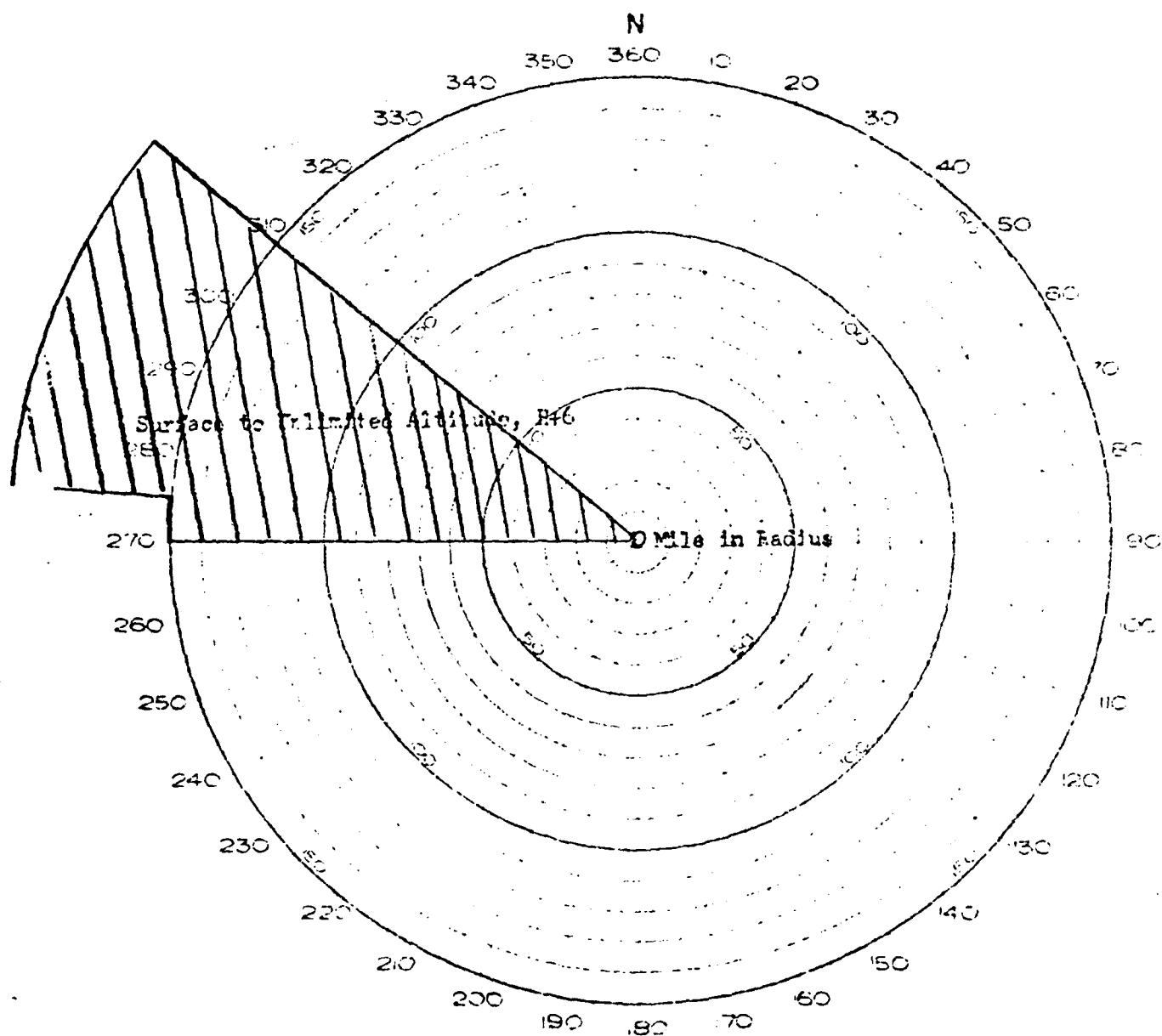
3. The helicopters took off at 1800M to survey the southern island chain. The highest reading was made over William at 200 feet: 150 r/hr.

4. Fallout was forecast along a bearing of 290 degrees; however, the wind pattern continued to shift to the south throughout the evening. The P2V encountered a reading of 1.3 r/hr at 1755M, 30 miles due west of Peter. To verify this shift and protect Eniwetok, P2V aircraft were worked on various tracks between Eniwetok and Bikini until 0210M 23 July.



HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



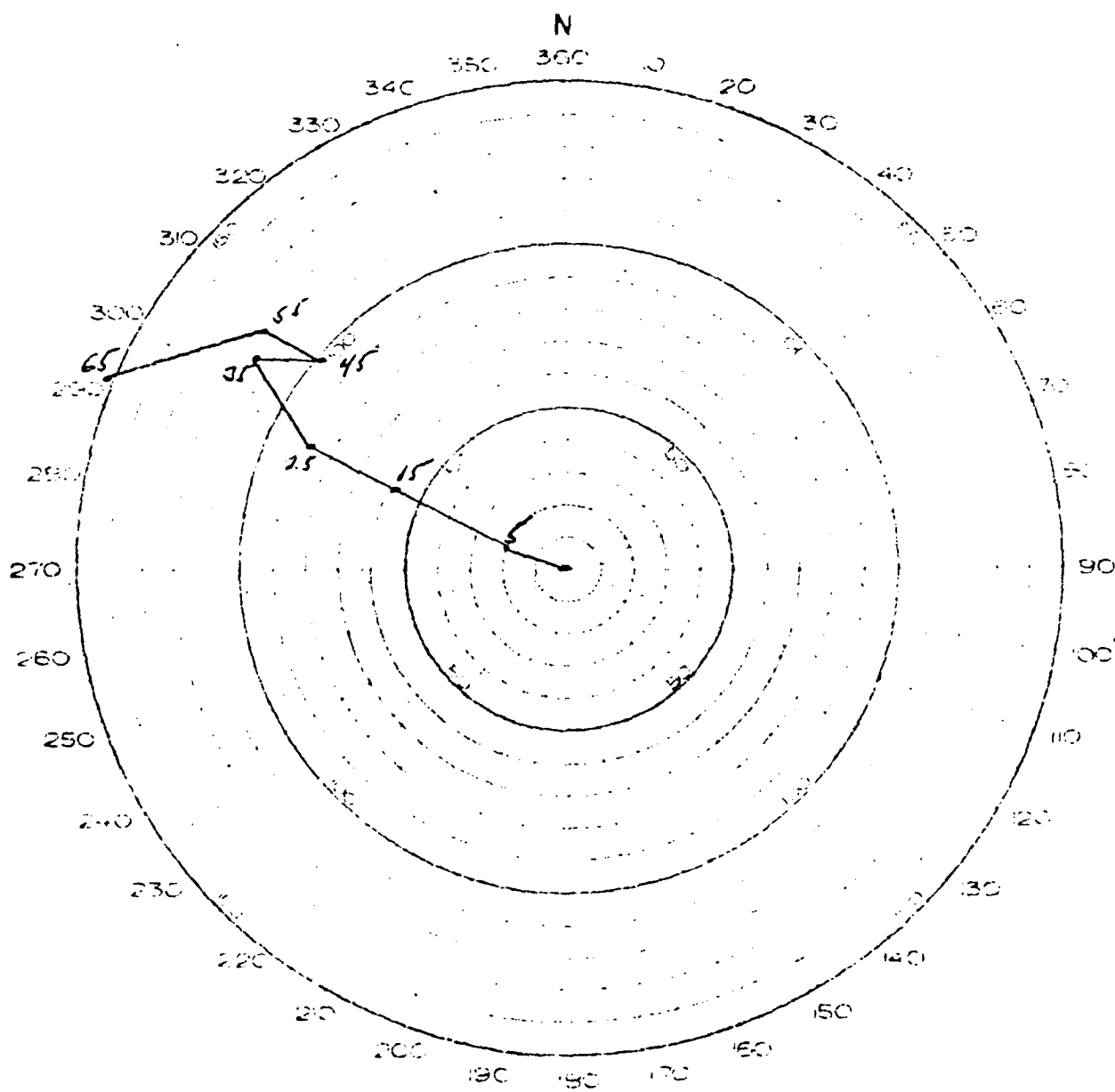
JUNIPER EVENT

Surface and Air Radex

TAB D

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



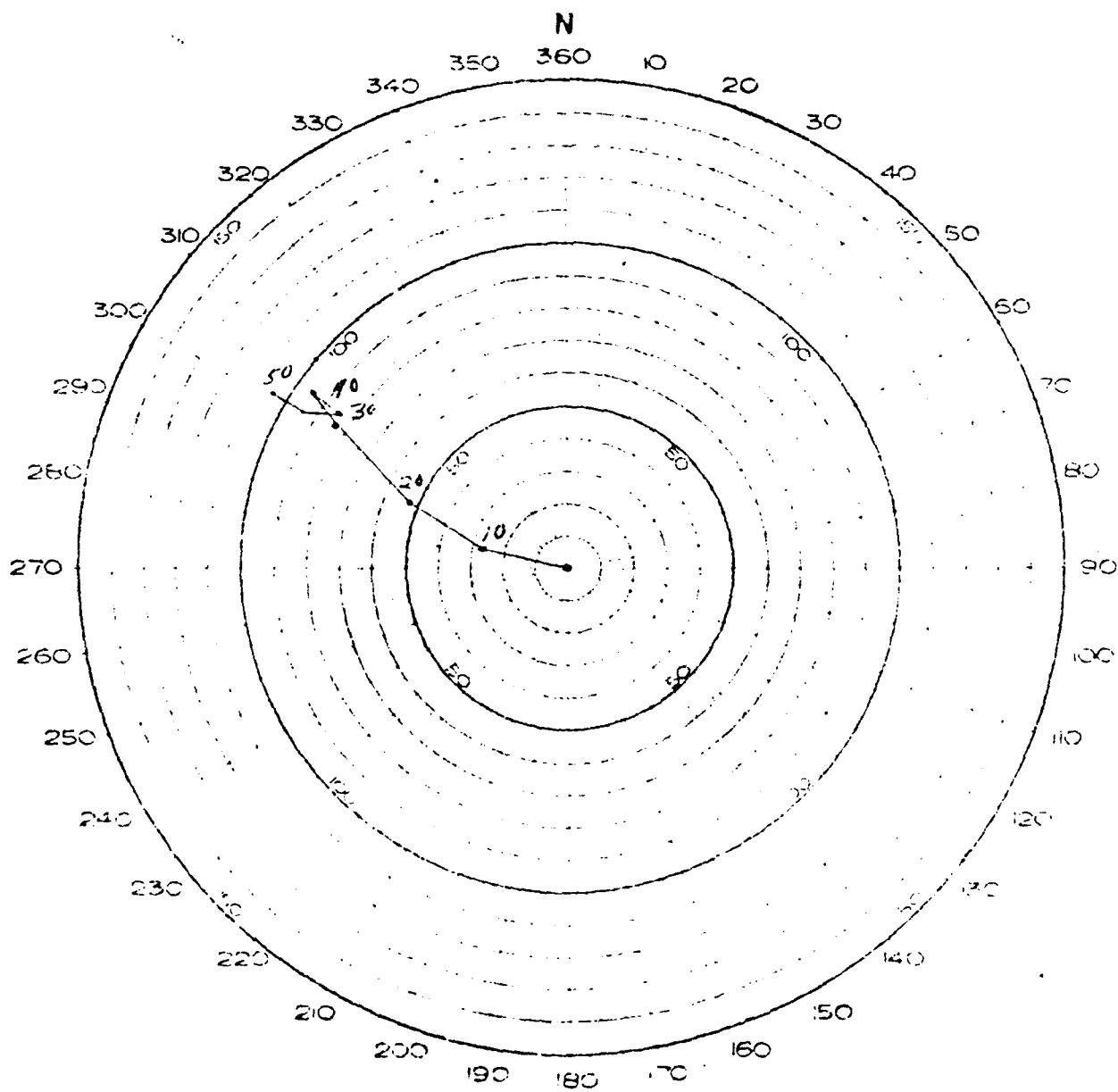
JUNIPER EVENT

Forecast Hodograph

TAF E-1

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



JUNIFER EVENT

Shot-time Hodograph

117

TAB E-2

RADSAFE

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

24 July 1958

JUNIPER

BIKINI OBSERVED WEATHER FOR 22 JULY 1958

SURFACE WEATHER:

Sea Level Pressure	1009.5 mbs
Free Air Surface Temperature	87.5° F
Wet Bulb Temperature	81.0° F
Dew Point Temperature	78.9° F
Relative Humidity	76%
Surface Wind	090° 17 knots
Weather	None

CLOUDS:

Scattered (2/10) cumulus, bases 2,000 feet. Scattered (4/10) altocumulus, bases 16,000 feet. Scattered (4/10) cirrostratus, bases unknown.

STATE OF THE SEA:

Open Sea: Waves 3 to 8 feet high, period 5 - 6 seconds, length 80 to 110 feet.
Lagoon: Waves 1 to 2 feet high, period 3 - 4 seconds.

JUPITER

DIKINI RADIOSONDE OBSERVATION

<u>Pressure</u> <u>(Millibars)</u>	<u>Height</u> <u>(Feet)</u>	<u>Temperature</u> <u>(°C)</u>	<u>Dew Point</u> <u>(°C)</u>
1010	Surface	27.5	22.8
1000	300	26.8	22.5
850	4,950	17.2	15.2
700	10,320	08.2	04.8
634	13,058	03.2	-00.5
624	13,451	02.2	-11.5
302	14,370	01.2	-15.2
600	14,450	01.2	-12.5
590	14,895	00.5	-03.5
570	15,814	-01.2	-03.2
500	19,200	-06.2	-10.5
442	22,342	-12.2	-18.8
412	24,081	-15.2	-19.2
400	24,820	-15.5	-21.5
300	31,700	-31.8	-38.5
258	35,171	-40.2	-48.8
250	35,840	-41.5	Miss
200	40,670	-53.5	Miss
150	46,530	-67.5	Miss
122	50,525	-76.0	Miss
100	54,200	-76.5	Miss
099	54,432	-76.0	Miss
092	55,774	-73.0	Miss
077	59,252	-74.0	Miss
075	59,810	-70.0	Miss
070	61,286	-70.0	Miss
067	62,008	-67.0	Miss
050	67,810	-63.8	Miss
048	68,569	-63.0	Miss
046	69,521	-59.0	Miss
032	79,068	-57.0	Miss
020	82,180	-53.2	Miss

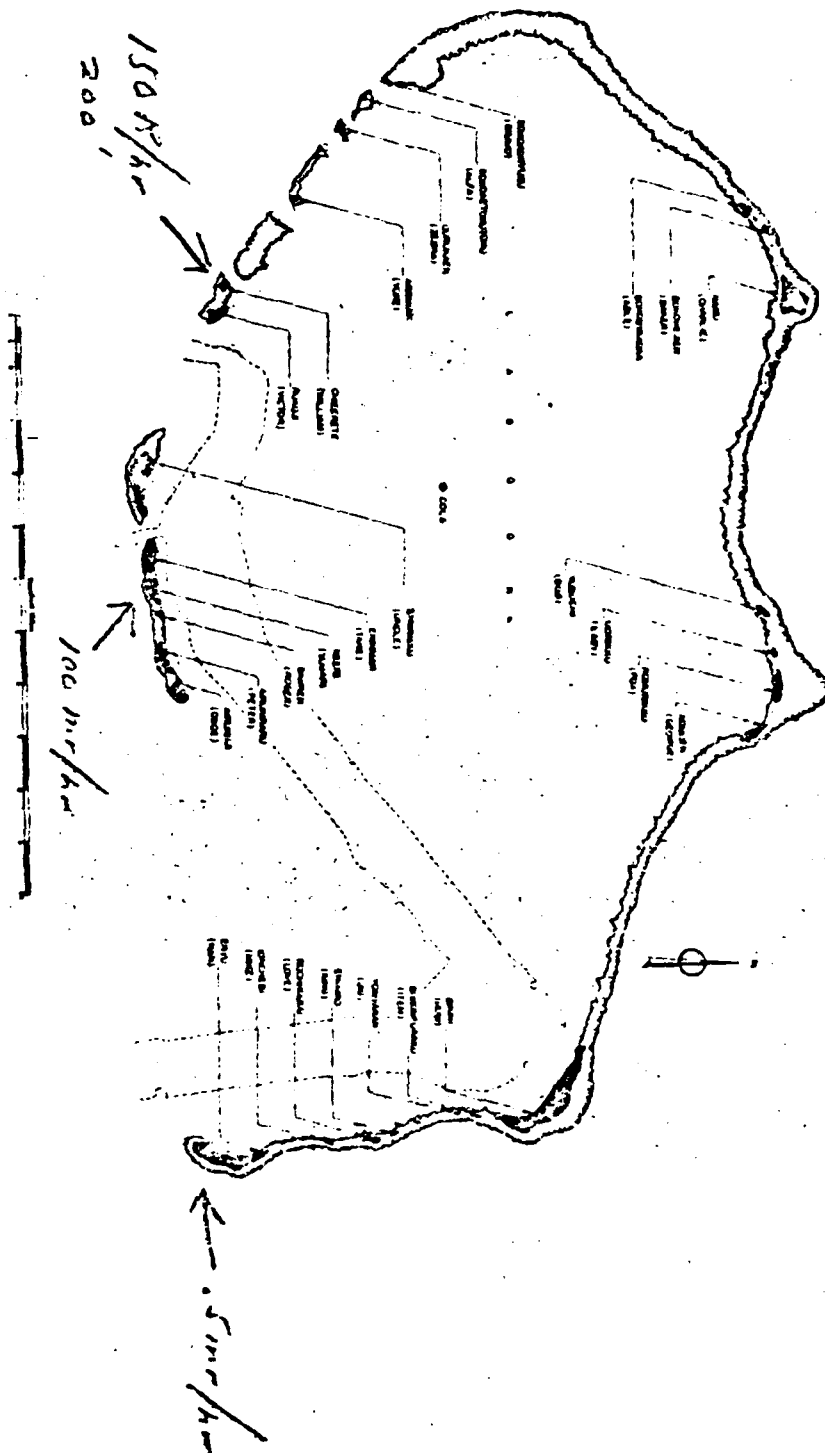
JUNIPER

BIKINI WINDS ALOFT OBSERVATION

<u>Height</u> <u>(Feet)</u>	<u>Direction</u> <u>(Degrees)</u>	<u>Velocity</u> <u>(Knots)</u>
Surface	080	14
1,000	080	16
2,000	090	17
3,000	100	18
4,000	100	18
5,000	100	17
6,000	110	16
7,000	110	14
8,000	110	11
9,000	110	08
10,000	110	09
12,000	120	11
14,000	120	14
16,000	130	12
18,000	130	13
20,000	130	16
22,000	130	17
24,000	140	19
26,000	140	18
28,000	140	15
30,000	140	13
32,000	140	14
34,000	140	16
36,000	230	10
38,000	300	09
40,000	310	10
42,500	350	11
45,000	080	09
47,500	120	08
50,000	120	11
52,500	130	12
55,000	230	16
57,500	010	11
60,000	080	27
65,000	090	31
70,000	100	42
75,000	090	44
80,000	080	55
85,000	090	58
90,000	080	58
95,000	080	66
100,000	090	68
105,000	090	70
108,000	090	72

MAP OF BIKINI ATOLL

Radio logical Surface Survey, H+3 Hours



INDEX

TAB

A--Summary, OLIVE Event, Operation HARTACK

B--Forecast Fallout Plot

C--Trajectory Plot

D--Surface and Air Index

E-1. Forecast Hodegraph

2. Shot-time Hodegraph

3. Weather Summary

F--Radiological Surface Survey, H+5 Hours

OLIVE EVENT

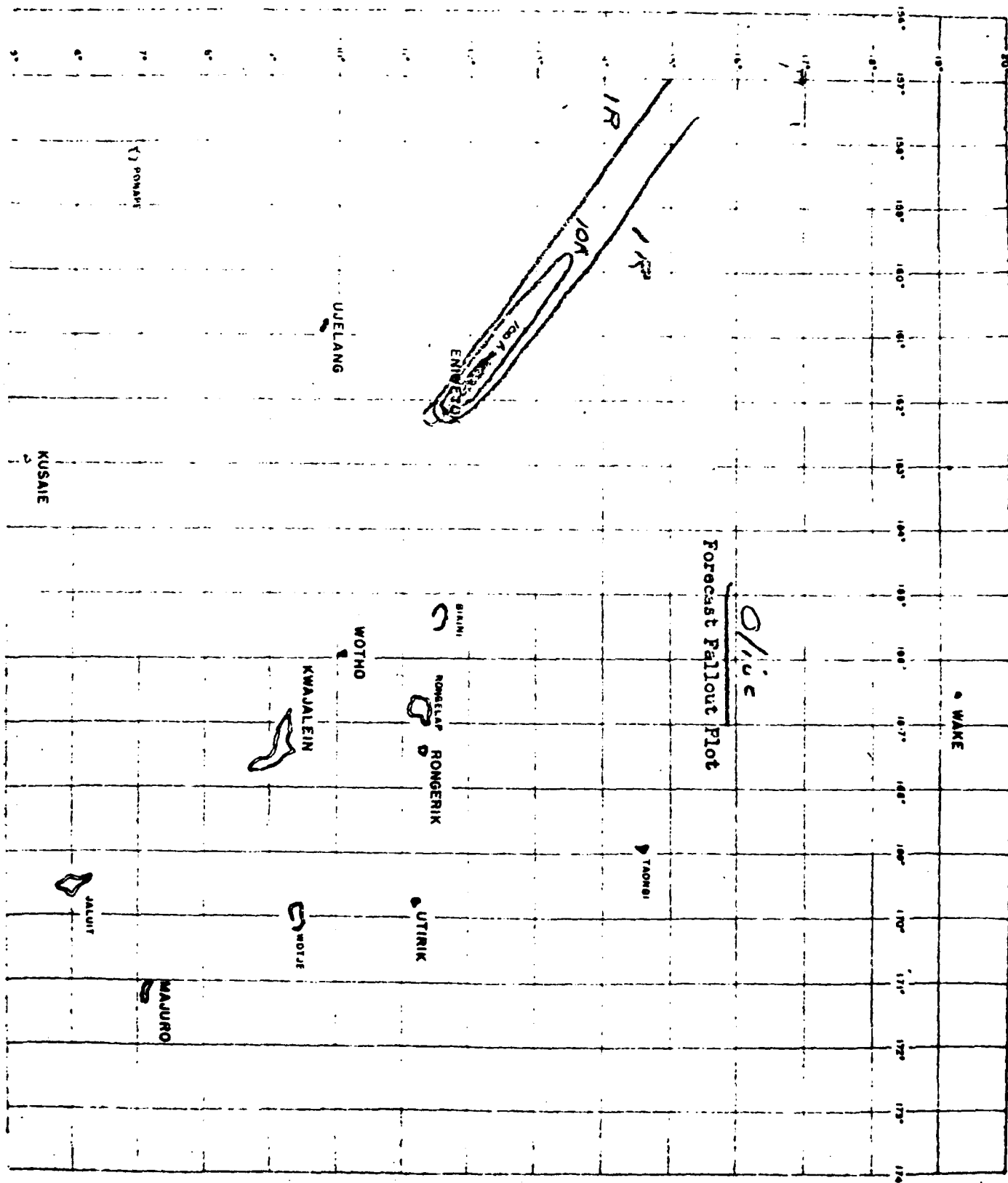
OPERATION HARDTACK

1. The OLIVE device was detonated on a barge off Janet Island, Eniwetok Atoll, at 0820M, 23 July 1958. The cloud rose to 50,000 feet, and the base was estimated at 15,000 feet. [REDACTED]

2. The P2V aircraft reported over Alvin at 0900M, at 1,000 feet, and it was vectored to Keith, to Yvonne, to Leroy, to Wilma, to Lerry. Only background was recorded. The northern part of the atoll was cleared slowly, and the highest reading, 3.5 mr/hr, was recorded abeam the ground zero point at 0955M. Re-entry hour was declared at 1000M, and the P2V was vectored out of the lagoon on westerly and northeasterly radials.

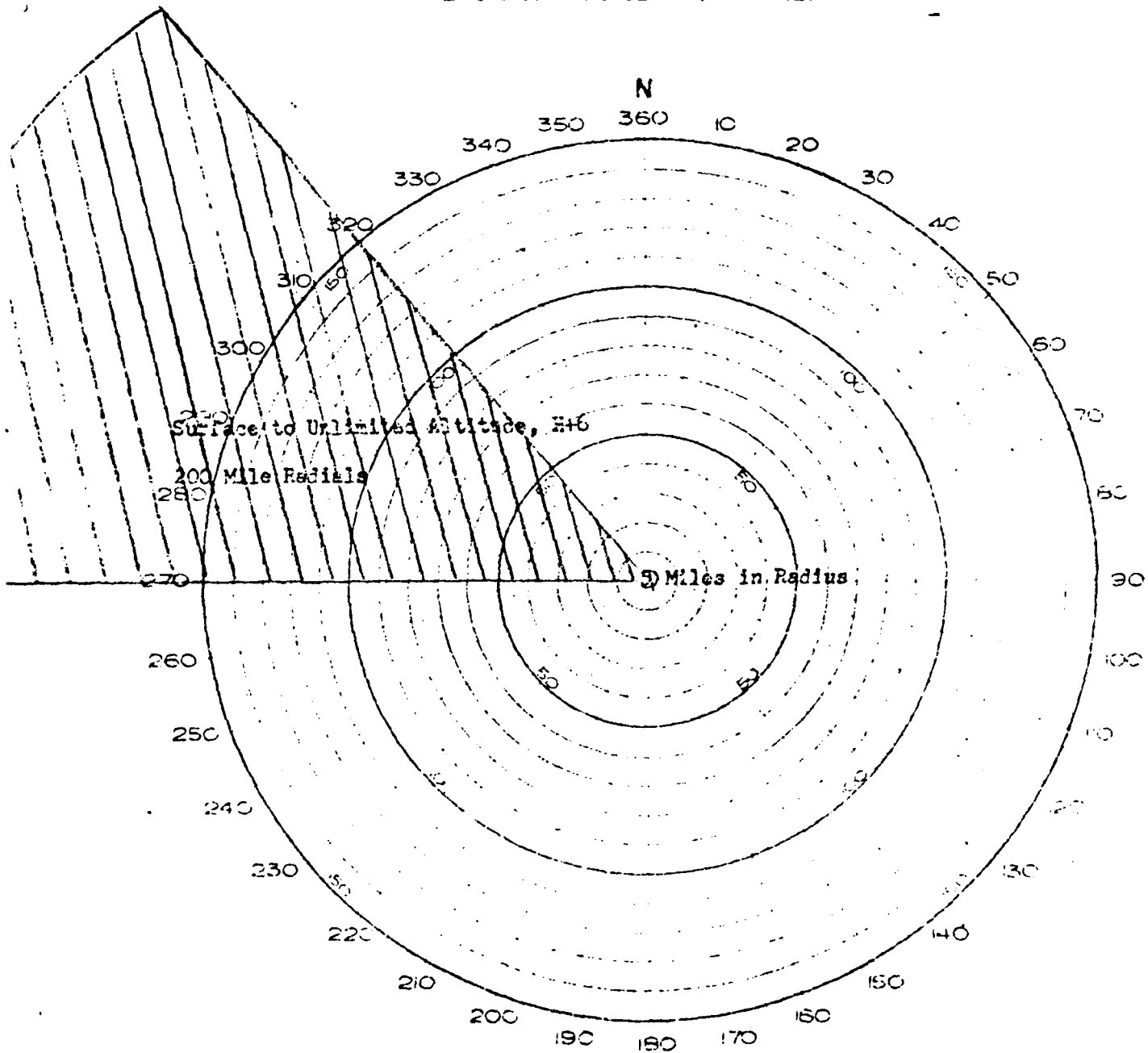
3. The helicopter survey took off at 1038M. The highest reading was made over Janet at 25 feet: 600 mr/hr.

4. Fallout was forecast along a bearing of 300 degrees, but the wind pattern shift more to the south in the lower altitudes.



HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX

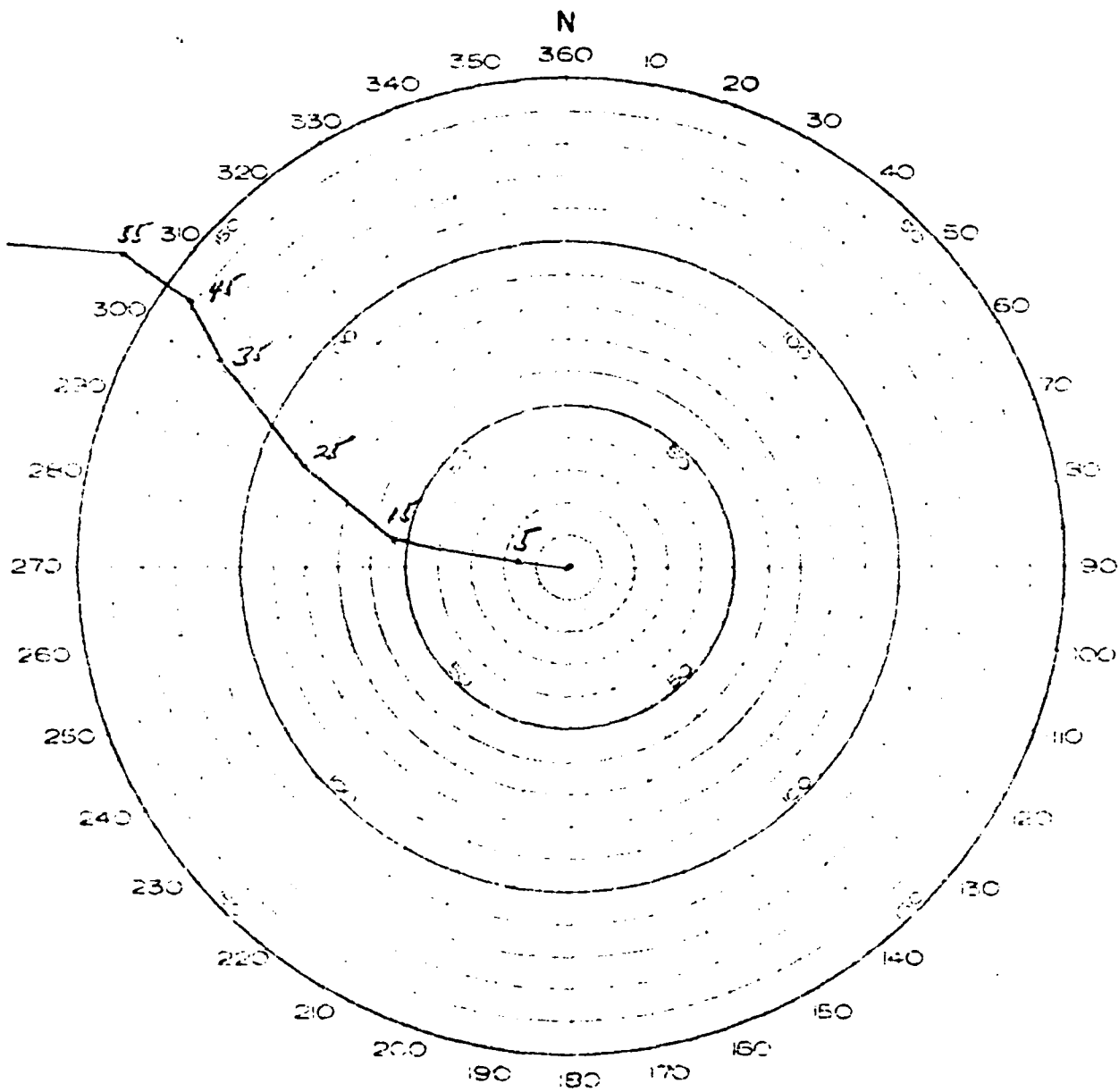


OLIVE EVENT

Surface and Air Radex

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



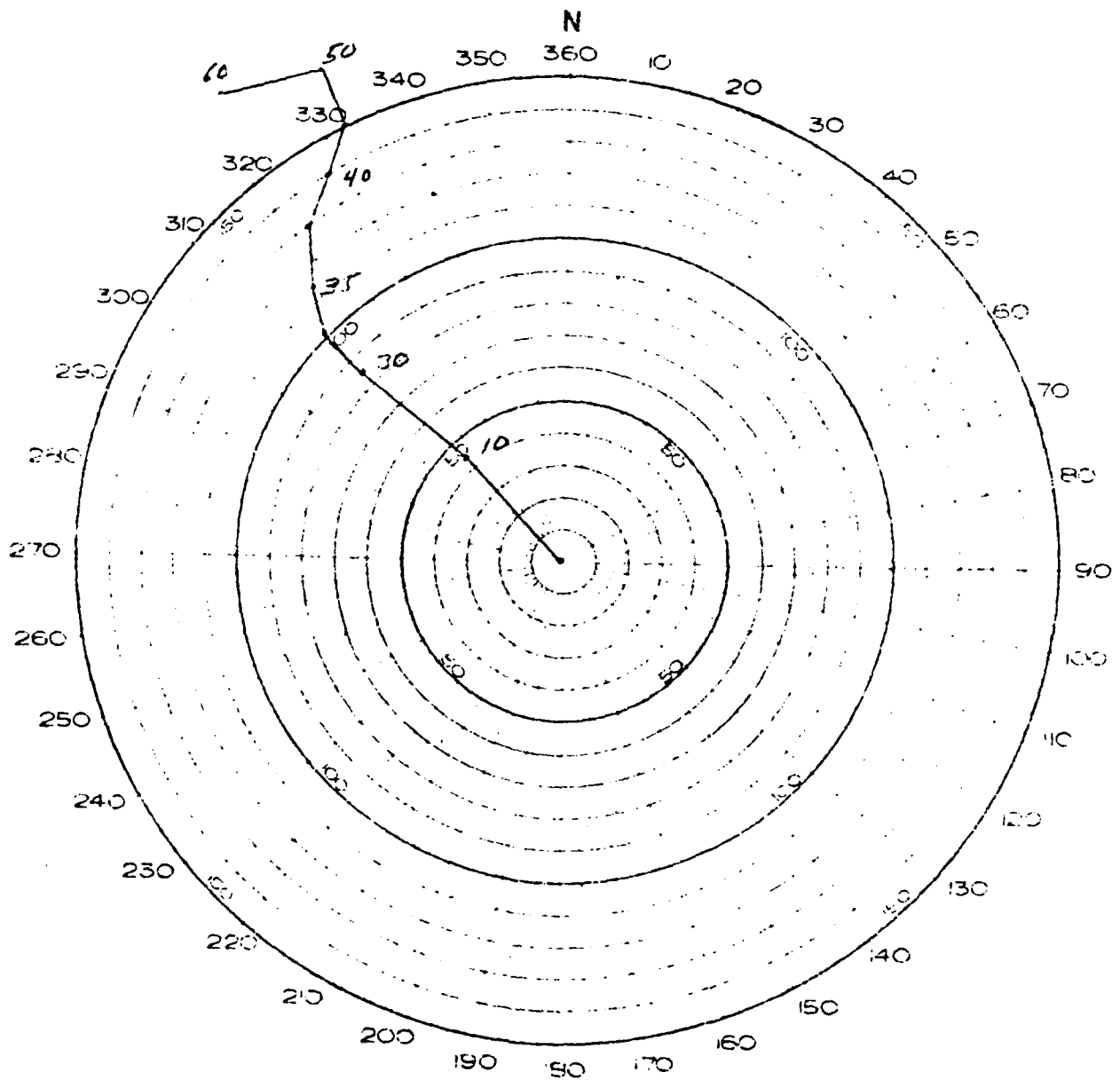
CLIVE EVENT

Forecast Hodograph

TAB E-1

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



OLIVE EVENT

Shot-time Hodograph

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

24 July 1958

OLIVE

ENHETOK OBSERVED WEATHER FOR 23 JULY 1958

SURFACE WEATHER:

Sea Level Pressure	1009.7 mbs-
Free Air Surface Temperature	79.9° F
Wet Bulb Temperature	76.9° F
Dew Point Temperature	76.0° F
Relative Humidity	89%
Surface Wind	130° 13 knots
Visibility	8 miles
Weather	Very light rainshowers

CLOUDS:

Scattered (2/10) cumulus, bases 1,000 feet. Broken (3/10) altostratus - altocumulus, bases 11,000 feet. Broken (3/10) cirrostratus, bases unknown.

AREA WEATHER SUMMARY FROM AIRCRAFT:

Scattered (2/10) cumulus, bases unknown. Broken (3/10) altostratus - altocumulus, bases 20,000 to 22,000. Scattered (5/10) cirrus becoming broken (3/10) cirrus west, bases 30,000, some bases 34,000.

STATE OF THE SEA:

Open Sea: Waves 6 feet high, period 5 seconds, length 80 feet.
Lagoon: Waves 1 foot high, period 3 - 4 seconds.

OLIVE

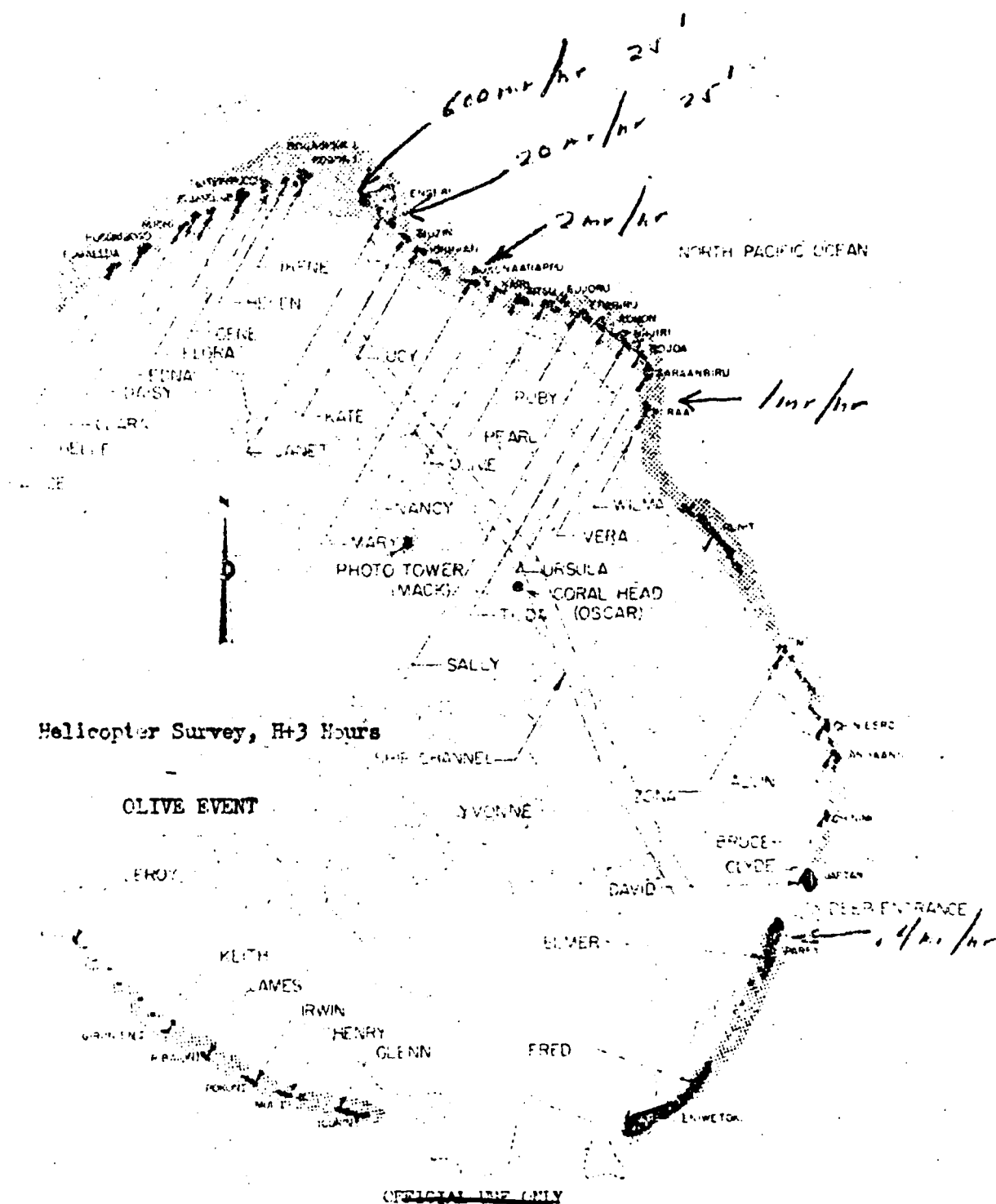
ENHETOK RADIOSONDE OBSERVATION

<u>Pressure</u> <u>(Millibars)</u>	<u>Height</u> <u>(Feet)</u>	<u>Temperature</u> <u>(°C)</u>	<u>Dew Point</u> <u>(°C)</u>	<u>↓</u>
1009	Surface	25.5	23.5	-
1000	280	25.2	22.8	
850	4,820	19.2	13.8	
700	10,310	09.2	01.2	
673	11,417	07.5	-01.5	
647	12,402	05.5	01.8	
600	14,450	02.2	-01.5	
500	19,210	-06.2	-18.8	
400	24,350	-13.8	-17.2	
300	31,790	-31.2	-37.8	
270	34,121	-37.0	-44.5	
250	35,940	-42.0	Miss	
200	40,760	-55.2	Miss	
150	46,590	-69.9	Miss	
139	47,999	-73.0	Miss	
100	54,350	-76.1	Miss	
096	55,118	-76.0	Miss	
055	66,109	-62.0	Miss	
050	67,940	-62.6	Miss	
047	69,193	-60.0	Miss	
034	75,951	-60.0	Miss	
025	82,250	-53.2	Miss	
022	85,138	-60.0	Miss	
010	102,184	-36.0	Miss	

OLIVE

ENIWETOK WINDS ALOFT OBSERVATION

<u>Height</u> <u>(Feet)</u>	<u>Direction</u> <u>(Degrees)</u>	<u>Velocity</u> <u>(Knots)</u>	
Surface	120	10	-
1,000	140	19	
2,000	140	21	
3,000	140	23	
4,000	140	25	
5,000	140	25	
6,000	140	23	
7,000	140	24	
8,000	130	21	
9,000	130	18	
10,000	130	20	
12,000	130	21	
14,000	130	21	
16,000	130	23	
18,000	120	23	
20,000	130	19	
22,000	130	18	
24,000	140	15	
26,000	150	14	
28,000	160	15	
30,000	170	15	
32,000	170	15	
34,000	170	17	
36,000	180	18	
38,000	200	15	
40,000	200	17	
42,500	200	18	
45,000	200	14	
47,500	180	13	
50,000	150	18	
52,500	070	18	
55,000	070	19	
57,500	070	16	
60,000	080	11	
65,000	090	31	
70,000	090	42	
75,000	090	61	
80,000	090	64	
85,000	090	72	
90,000	090	76	
95,000	090	83	
100,000	090	74	



INDEX

THE

A--Summary, FIVE Event, Operation HARDPACK

B--Forecast Foliage Plot

C--Trajectory Plot

D--Surface and Air Radar

E--1. Forecast Holograph

2. Shot-time Holograph

3. Weather Summary

F--1. Radiological Surface Survey, H+3 Hours

2. Radiological Surface Survey, H+3 Hours

PINE EVENT
OPERATION HARBUTACK

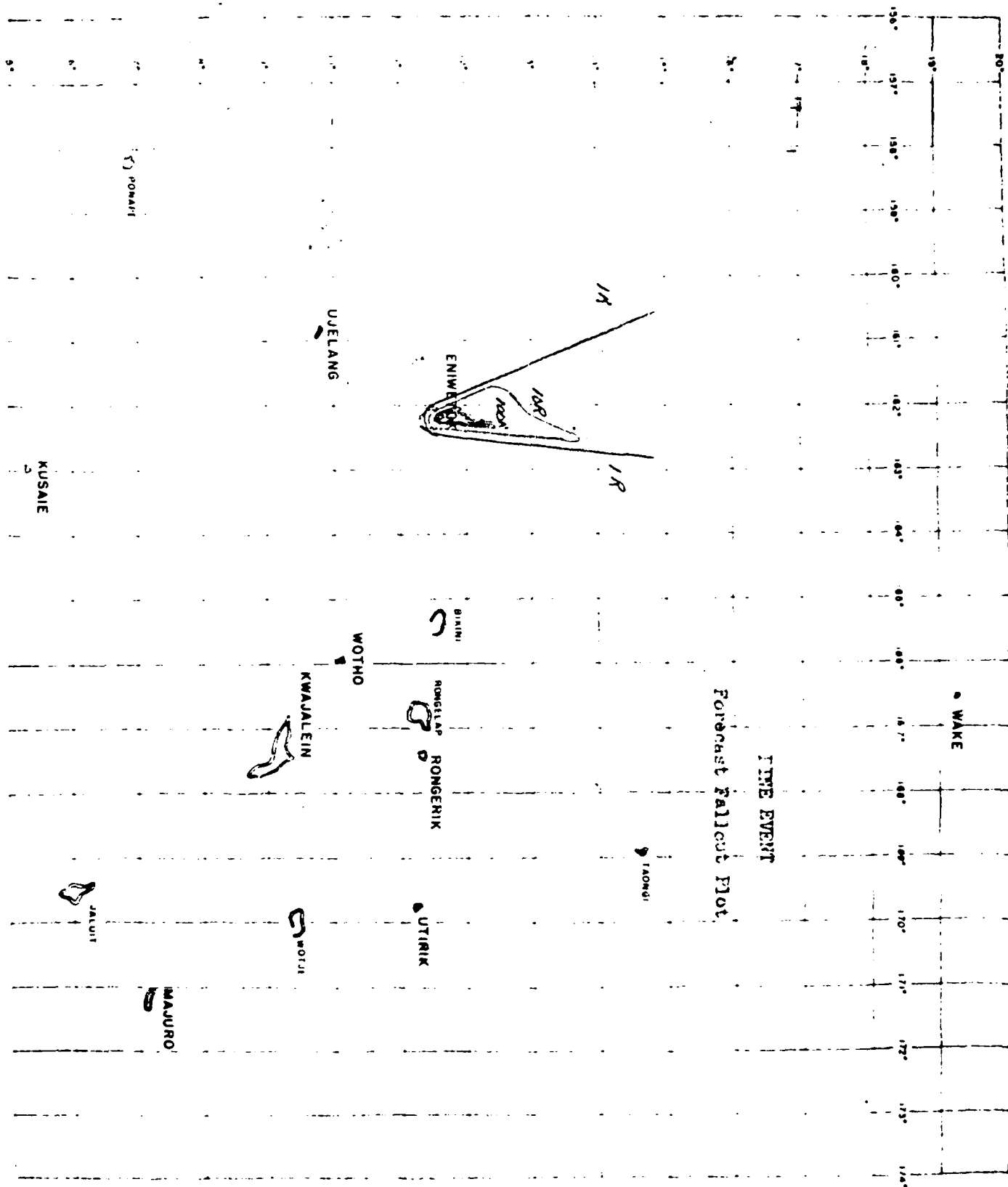
1. The PINE device was detonated on a barge off Janet Island, Eniwetok Atoll, at 0830M, 27 July 1955. The cloud rose immediately to 66,000 feet with a radar-established base of 38,000 feet.

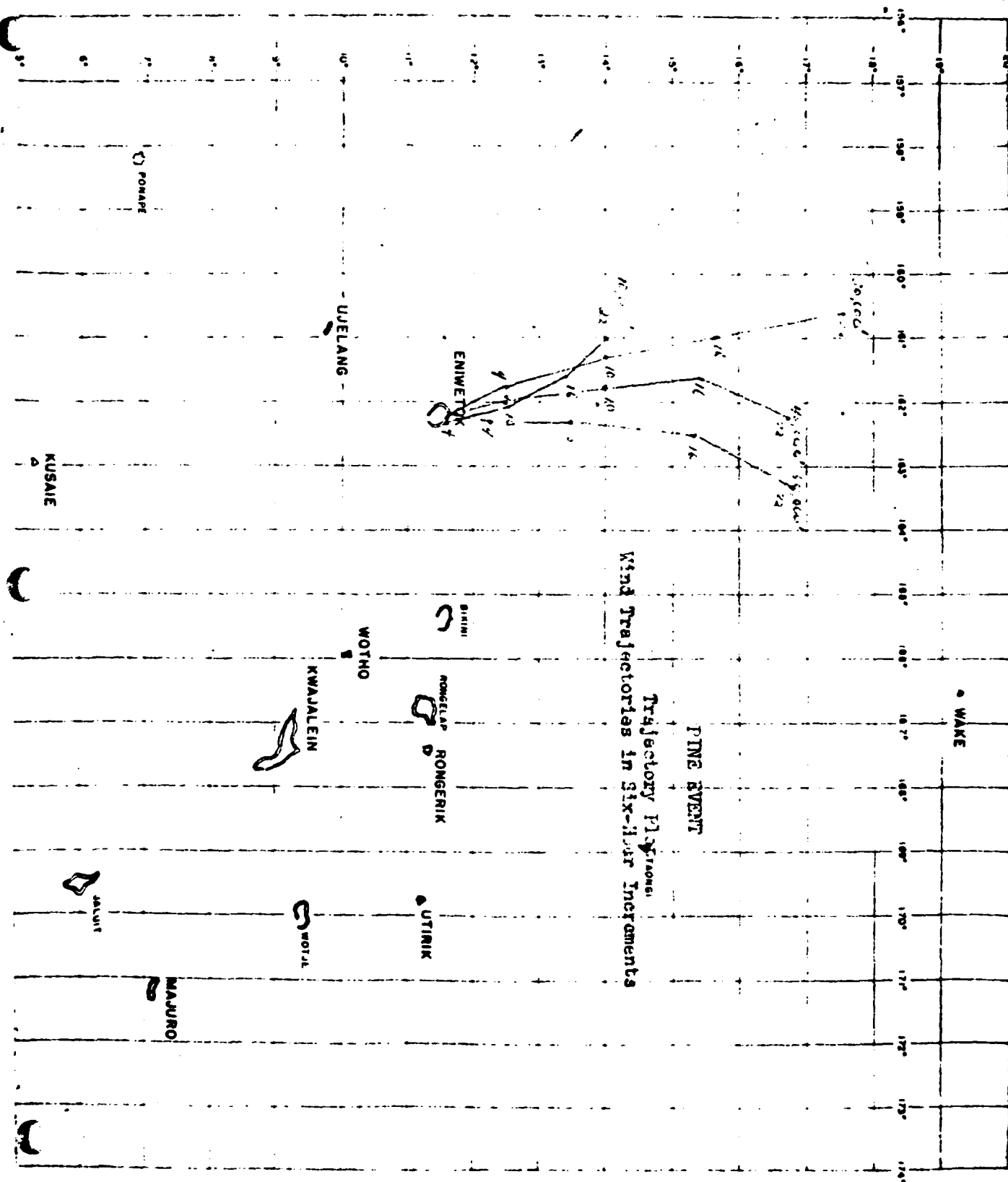
2. A P2V aircraft commenced the RadSafe survey of the southern part of the atoll at 0930M but went out of commission over Lacey at 0950M. Only background was recorded, and a second P2V arrived on station at 1115M. A pass south of ground zero at 1125M recorded the maximum reading on the atoll: 37 mr/hr. The P2V, plus a third P2V, was sent out on northwest and northeast radials until 1607M in an effort to define clearly the major fallout area.

3. Re-entry hour was declared at 1145M, and the helicopter survey took off at 1140M. The following three readings were made, at 50 feet: Yvonne, 3 mr/hr; Wilma, Zero; and Janet, 230 mr/hr. A detailed survey was made at 1600M.

4. It is estimated that fallout fell within the forecast area, or between the 330-degree radial and that of 040 degrees.

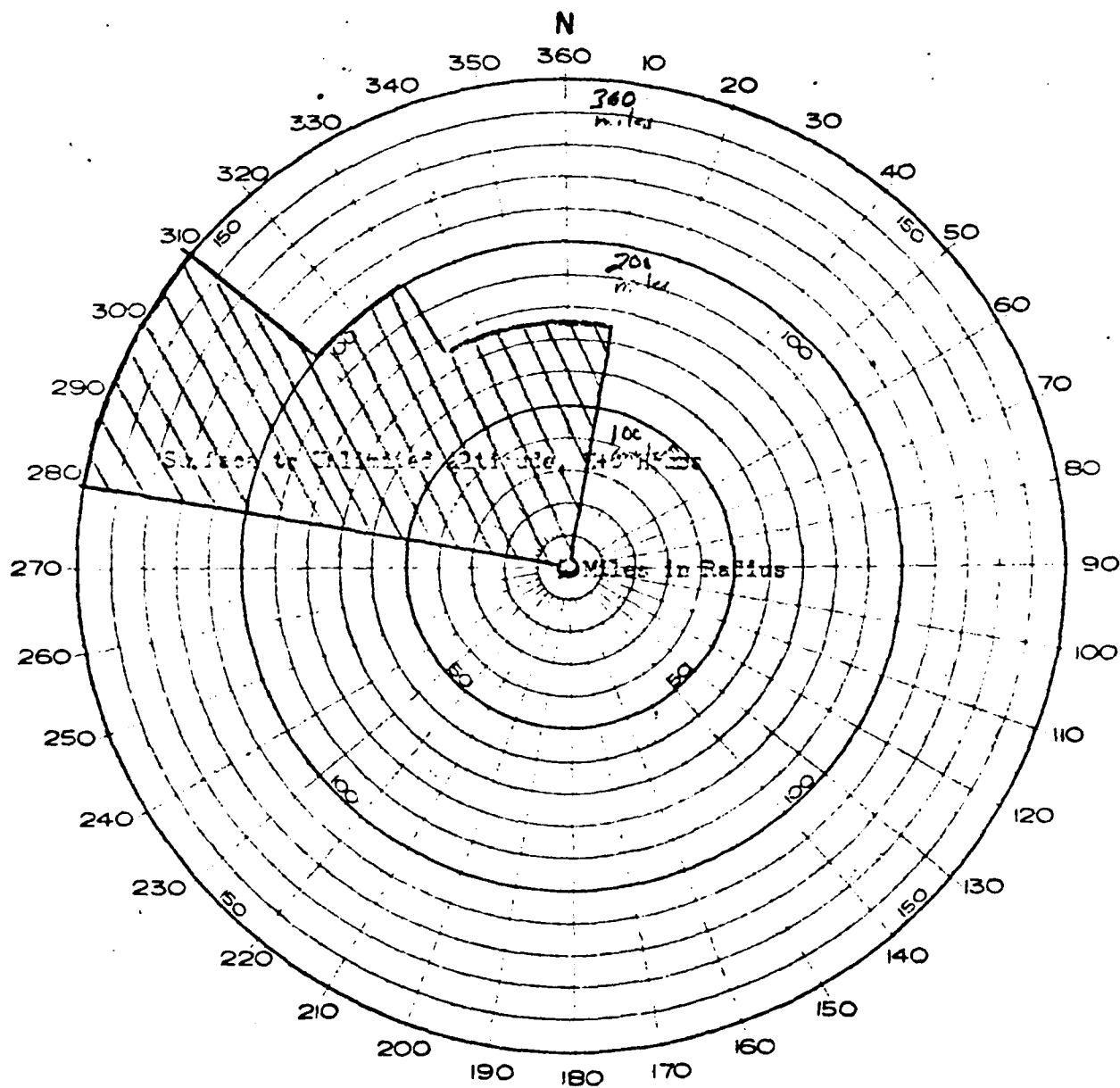
TAB A





HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX

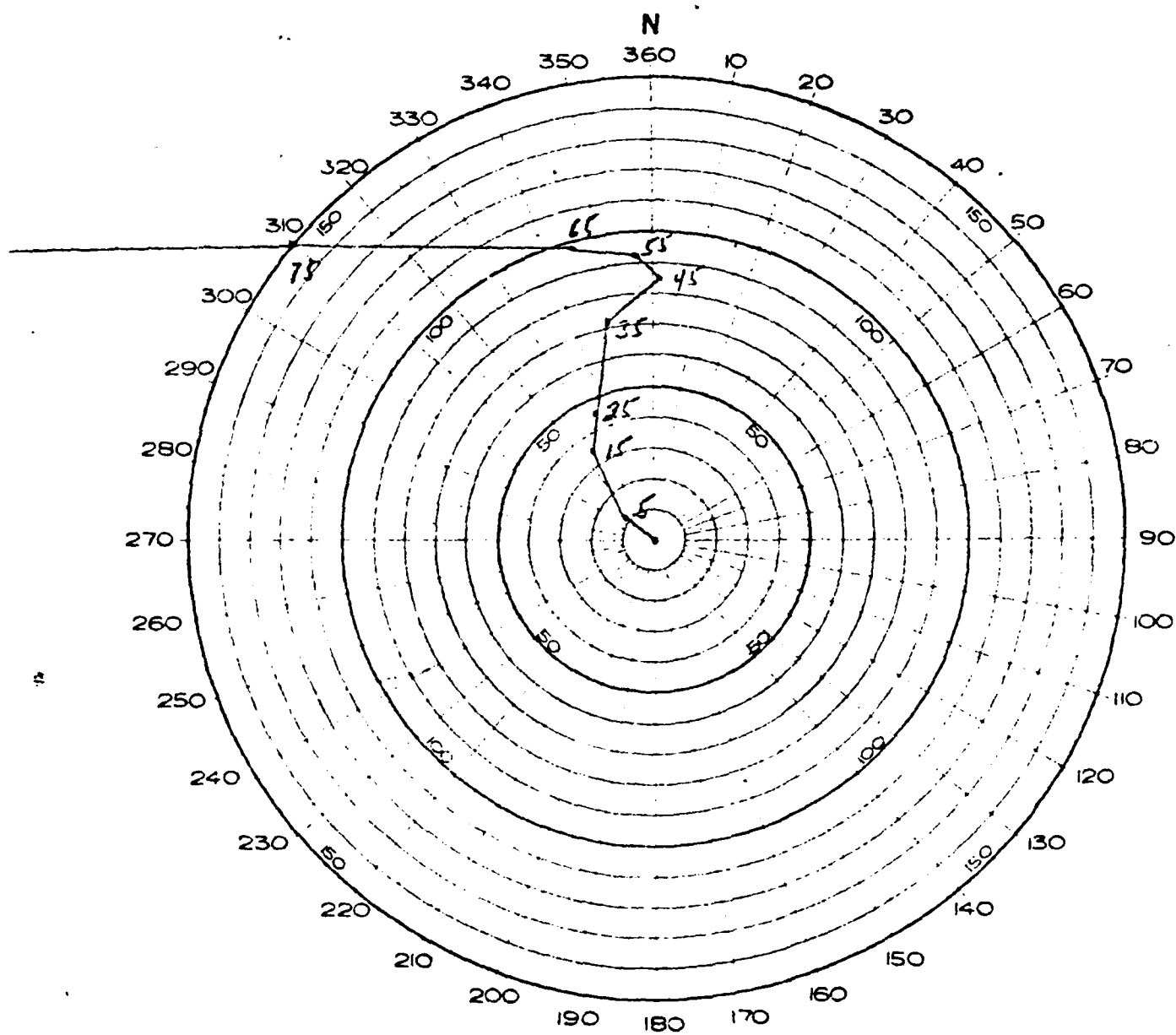


FINE EVENT

Surface and Air Radex

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX

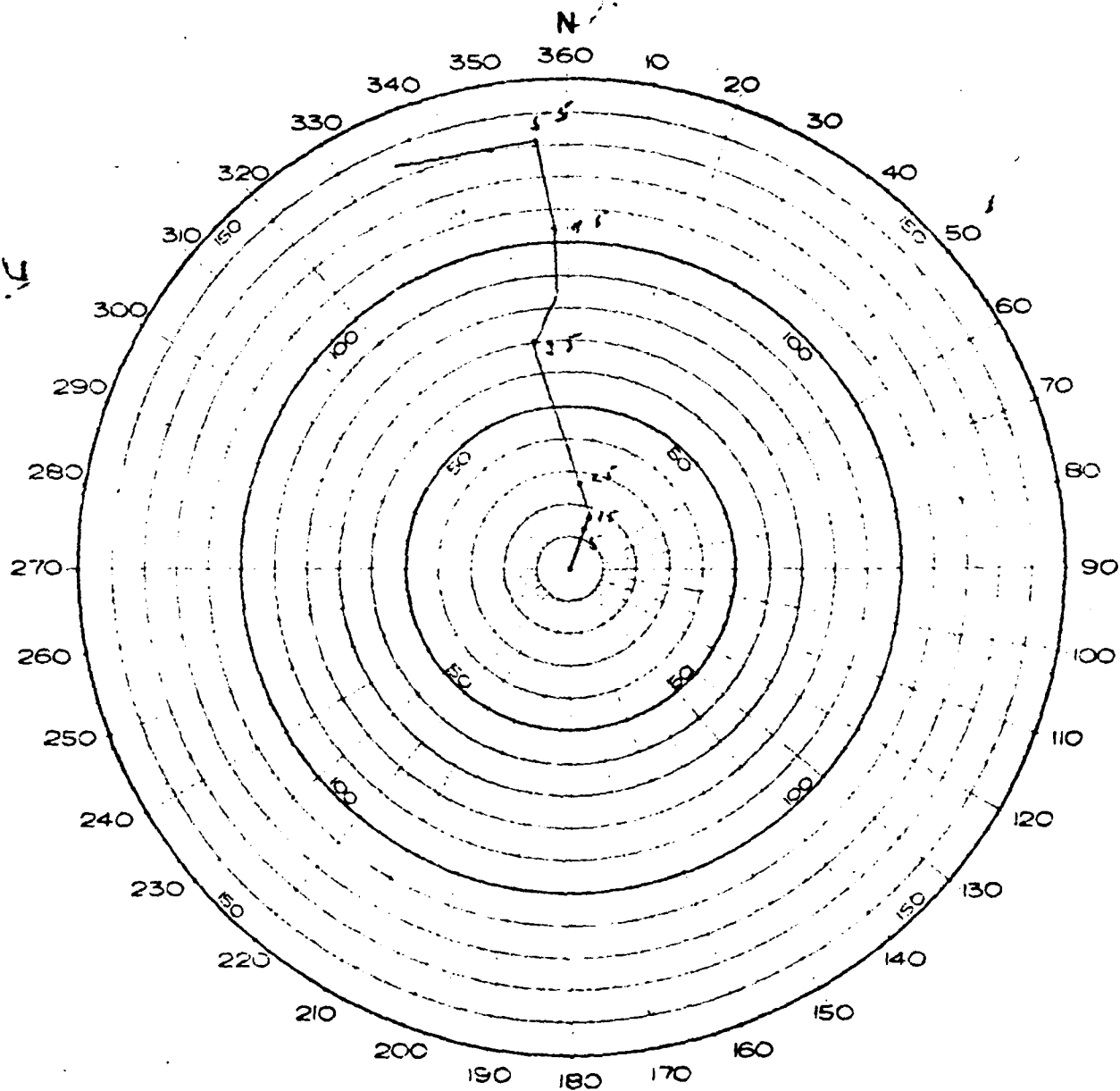


FINE EVENT
Forecast Hodograph

TAB E-1

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



FINE EVENT

Shot-time Hodograph

TAB E-2

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

29 July 1958

PINE

1

ENTIRETY OBSERVED WEATHER FOR 27 JULY 1958 -

SURFACE WEATHER:

Sea Level Pressure	1009.3 mbs
Free Air Surface Temperature	80.1° F
Wet Bulb Temperature	73.7° F
Dew Point Temperature	75.5° F
Relative Humidity	85%
Surface Wind	220° 16 knots
Visibility	10 miles
Weather	None

CLOUDS:

Scattered (5/10) cumulus, bases 1,400 feet. Scattered alto-cumulus - altostratus (5/10), bases 8,000 feet. Overcast (10/10) cirriform, bases unknown.

AREA WEATHER SUMMARY FROM AIRCRAFT:

Scattered (5/10) cumulus, bases and tops unknown. Scattered (5/10) altocumulus - altostratus in multiple layers, bases 20,000 to 34,000 feet, tops unknown. Broken (8/10 - 9/10) cirriform, bases 54,000 feet, tops unknown.

STATE OF THE SEA:

Open Sea: Waves 3 to 4 feet high, length 30 - 50 feet, period 3 - 4 seconds.
Lagoon: Waves 2 feet high, period 2 - 3 seconds.

PIRE

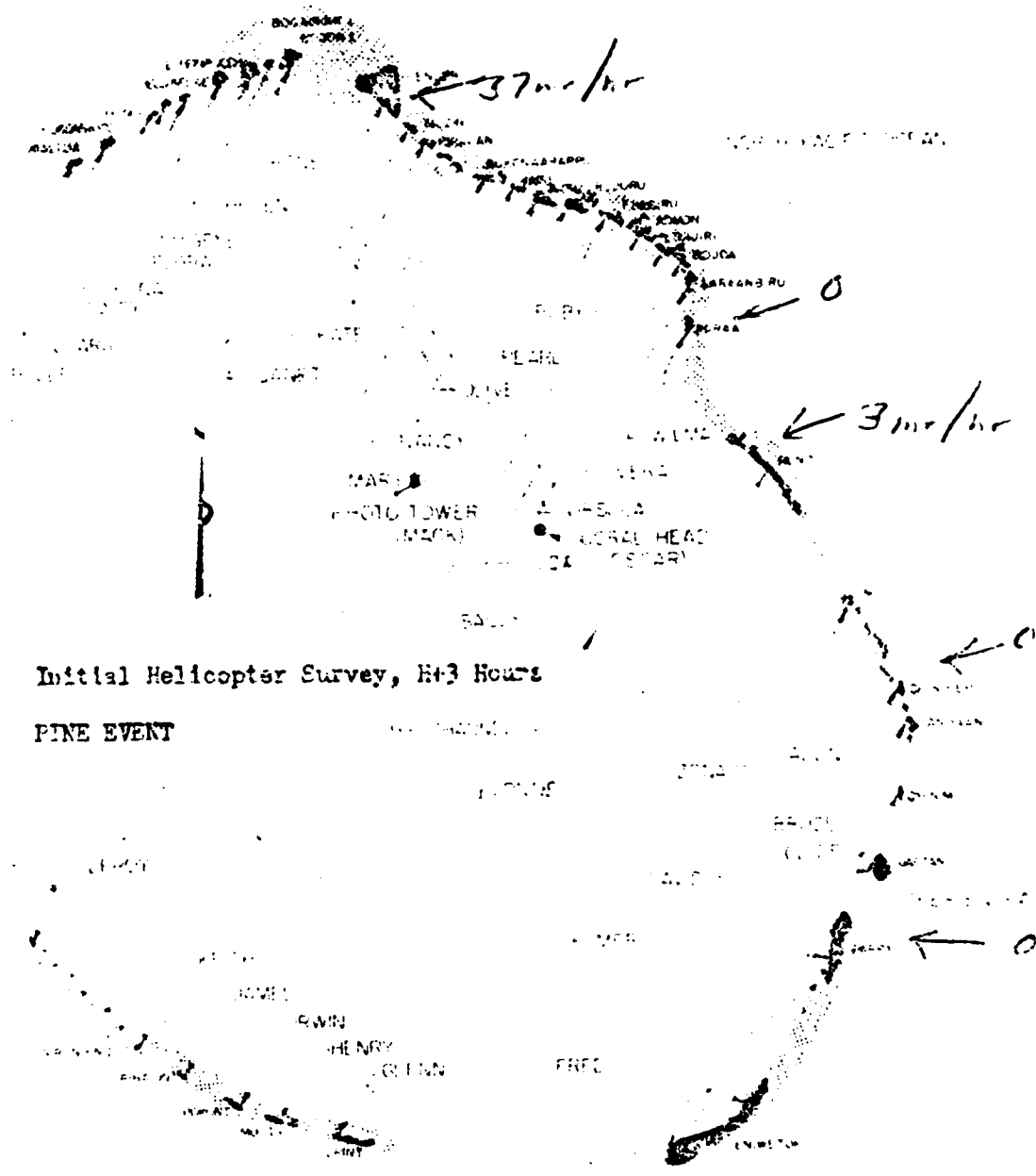
TRIUMPH RADIOSONDE OBSERVATION

<u>Pressure</u> <u>(Millibars)</u>	<u>Height</u> <u>(Feet)</u>	<u>Temperature</u> <u>(°C)</u>	<u>Dew Point</u> <u>(°C)</u>
1008	Surface	25.8	22.8
1000	250	28.5	22.2
850	4,890	10.2	14.5
772	7,612	15.2	09.2
700	10,290	09.2	05.5
640	12,730	04.2	02.2
600	14,430	01.2	-01.5
500	19,100	-05.8	-12.2
412	24,081	-14.8	-18.2
400	24,820	-16.2	-23.2
370	28,804	-20.8	-24.8
355	27,756	-22.2	-31.5
300	31,720	-30.8	-39.5
257	35,203	-32.2	-47.2
250	35,880	-40.8	Miss
200	40,720	-53.8	Miss
150	48,570	-60.8	Miss
111	52,293	-61.0	Miss
109	52,357	-70.0	Miss
100	54,280	-75.5	Miss
090	56,266	-70.0	Miss
075	59,908	-73.0	Miss
065	62,364	-65.0	Miss
055	65,978	-67.0	Miss
051	67,487	-59.0	Miss
050	67,940	-58.8	Miss
038	73,355	-64.0	Miss
037	74,147	-56.0	Miss
036	74,803	-55.0	Miss
034	75,853	-57.0	Miss
020	82,330	-51.8	Miss

PUE

ENINETOX WINDS ALOFT OBSERVATION

<u>Height</u> <u>(Feet)</u>	<u>Direction</u> <u>(Degrees)</u>	<u>Velocity</u> <u>(Knots)</u>
Surface	180	10
1,000	210	15
2,000	200	15
3,000	200	15
4,000	200	15
5,000	200	12
6,000	190	10
7,000	170	04
8,000	220	04
9,000	200	04
10,000	200	04
12,000	170	04
14,000	150	05
13,000	130	04
18,000	080	04
20,000	100	07
22,000	140	11
24,000	150	13
23,000	130	17
23,000	160	21
30,000	130	23
32,000	150	23
34,000	150	22
33,000	130	19
33,000	180	14
40,000	190	14
42,500	200	14
45,000	200	14
47,500	190	12
50,000	190	12
52,500	130	12
55,000	120	12
57,500	090	15
60,000	080	20
65,000	090	36
70,000	100	42
75,000	100	51
80,000	100	50
85,000	100	70
90,000	100	79
95,000	100	78
100,000	100	36
105,000	100	80
110,000	100	110
115,000	100	102



Initial Helicopter Survey, H+3 Hours

PINE EVENT

TEAK AND ORANGE EVENT

OPERATION HARDTACK

17
1

In view of the fact that the burst point was above the tropopause,
no RadSafe operations were required.

INDEX

TAB

A—Summary, QUINCE Event, Operation HARDTACK

B—Air and Surface Radex

C—Shot-time Hodograph

D—Weather Summary

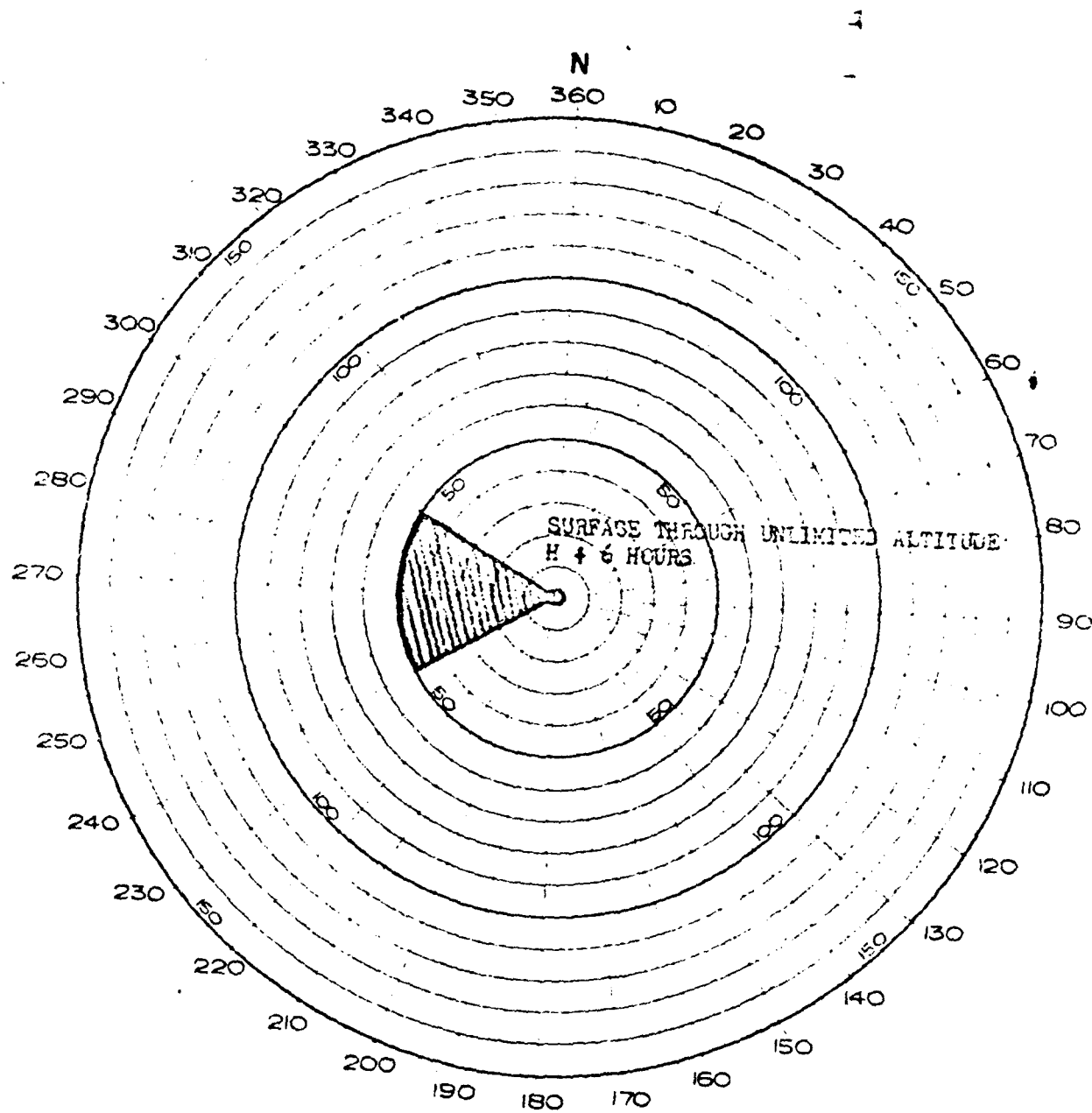
E—Radiological Surface Survey

QUINCE EVENT
OPERATION HARDTACK

1. The QUINCE device was detonated on Yvonne Island, Eniwetok Atoll at 1415M, 6 August 1958. The cloud rose to an estimated 1500 feet.
2. Re-entry hour was declared at 1615M.

KODOGRAPH

RESULTANT WINDS AND SURFACE RADEX

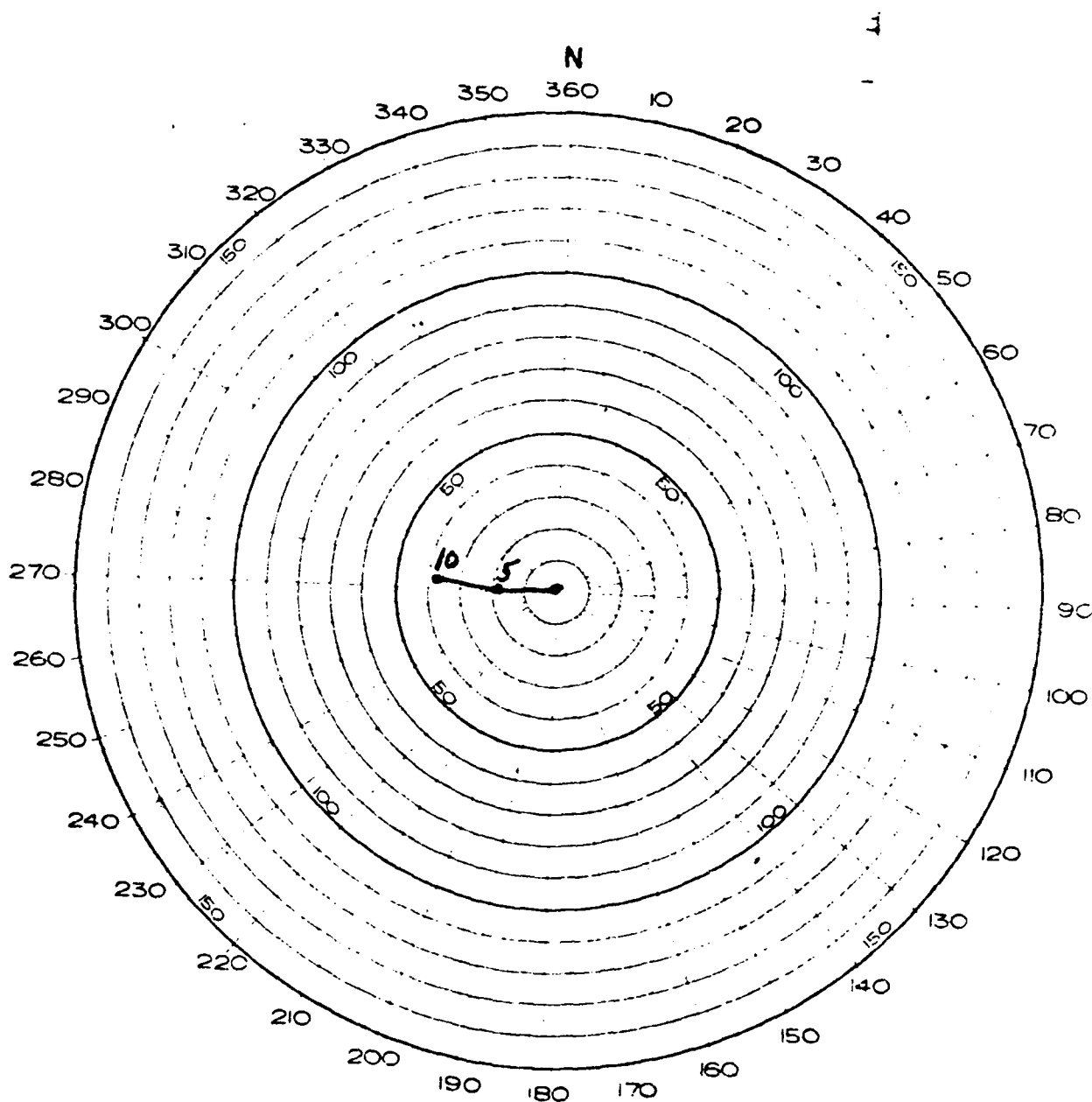


AIR & SURFACE RADEX
FIG & QUINCE EVENT

TAB B

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



SHOT-TIME HODOGRAPH

QUINCE EVENT

061415M AUGUST

TAB C

HEADQUARTERS
JOINT TASK FORCE SEVEN
APO 437, San Francisco, California

7 August 1958

QUINCE

1

ENHETOK OBSERVED WEATHER FOR 8 AUGUST 1958 -

SURFACE WEATHER:

Sea Level Pressure	1009.9 mbs
Free Air Surface Temperature	89.7° F
Wet Bulb Temperature	80.0° F
Dew Point Temperature	77.5° F
Relative Humidity	67%
Surface Wind	090° 12 knots
Visibility	10 miles
Weather	None

CLOUDS:

Scattered (4/10) cumulus, bases 2,000 feet.

QUINCE

ENHETOK RADIOSOUNDE OBSERVATION

<u>Pressure</u> <u>(Millibars)</u>	<u>Height</u> <u>(Feet)</u>	<u>Temperature</u> <u>(°C)</u>	<u>Dew Point</u> <u>(°C)</u>
1010	Surface	29.5	21.8
1000	310	28.8	22.7
990	500	28.0	22.0
980	1,000	27.2	21.2
962	1,500	25.2	21.5
944	2,000	23.8	18.5
924	2,500	22.8	17.2
912	3,000	22.2	15.5
894	3,500	21.5	10.3
885	4,000	21.2	03.5
863	4,500	17.5	13.2
850	4,970	19.5	11.2
848	5,000	19.4	12.0
834	5,500	18.5	14.2
820	6,000	17.5	17.2
804	6,500	16.5	12.2
790	7,000	16.5	12.5
773	7,500	14.2	10.5
765	8,000	13.8	10.5
750	8,500	13.2	07.8
734	9,000	12.8	02.5
720	9,500	11.8	-05.2
710	10,000	11.2	-05.5
700	10,360	10.5	-05.2

QUINCE

ENHETOK WINDS ALOFT OBSERVATION

<u>Height</u> <u>(Feet)</u>	<u>Direction</u> <u>(Degrees)</u>	<u>Velocity</u> <u>(Knots)</u>
Surface	090	14
1,000	080	15
2,000	090	16
3,000	100	16
4,000	100	17
5,000	100	19
6,000	100	20
7,000	100	21
8,000	100	20
9,000	100	18
10,000	090	18

TEAK AND ORANGE EVENT

OPERATION HARDTACK

In view of the fact that the burst point was above the tropopause,
no RadSafe operations were required.

INDEX

TAB

A—Summary, FIG Event, Operation HARDTACK

B—Air and Surface Radex

C—Shot-time Hodograph

FIG EVENT

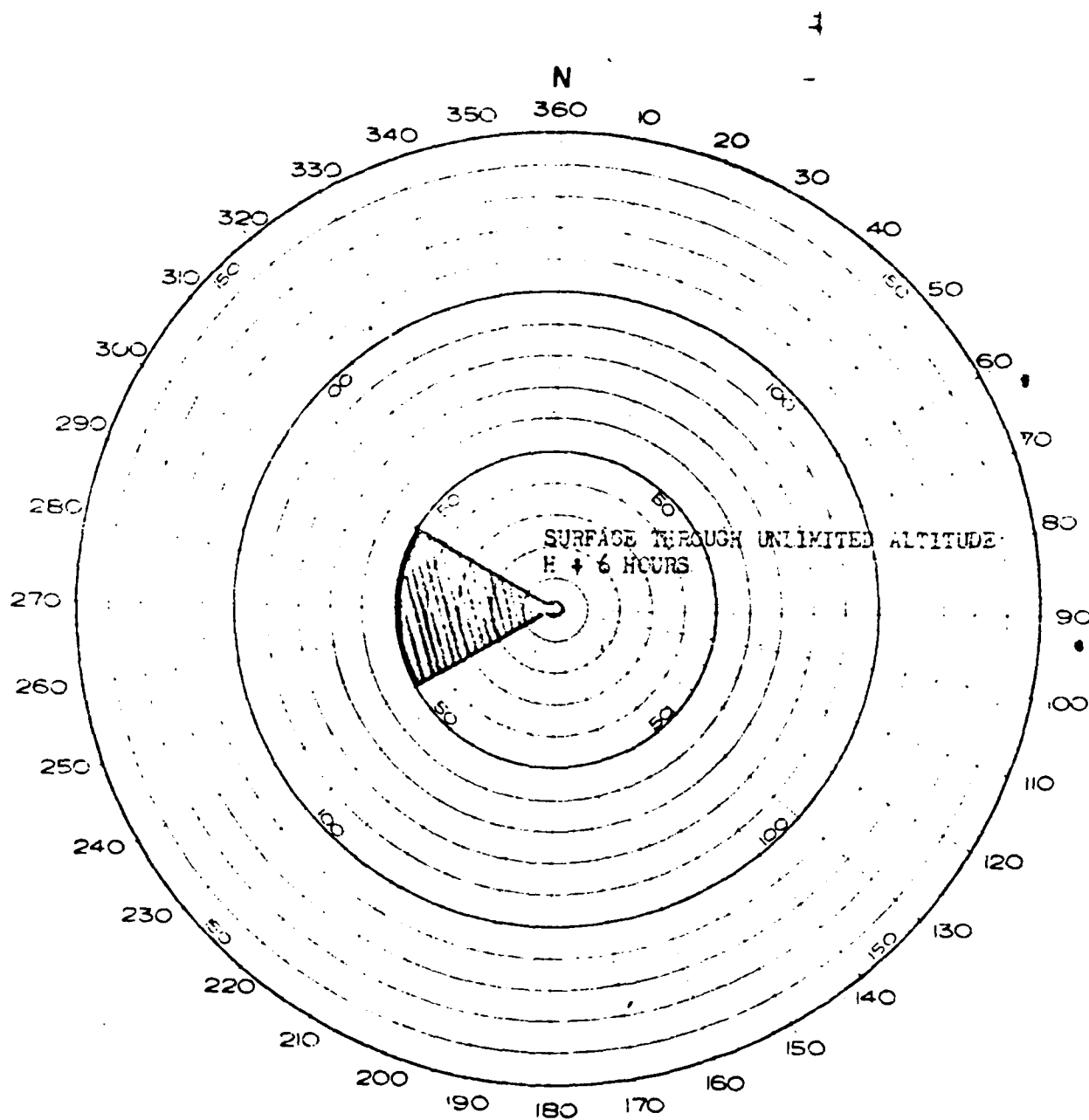
OPERATION HARDTACK

1. The FIG device was detonated on Yvonne Island, Eniwetok Atoll at 1600M, 18 August 1958. The cloud rose to an estimated 5-6000 feet.
2. Reentry hour was declared at 1800M, and the radex was cancelled at 1900M.

HODOGRAPH

RESULTANT WINDS AND

SURFACE RADEX

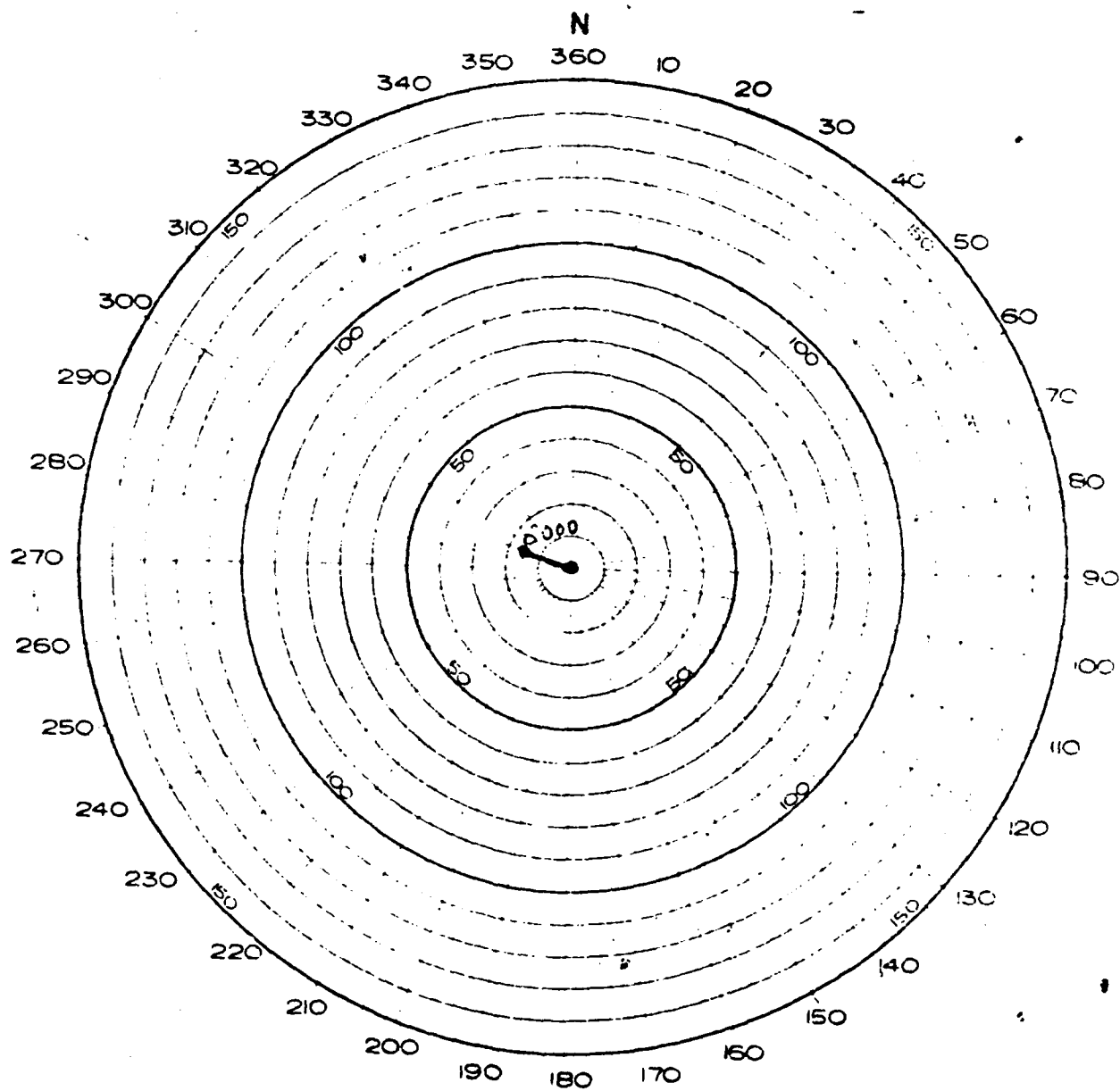


AIR & SURFACE RADEX
FIG & QUINCE EVENT

TAB B

HODOGRAPH

RESULTANT WINDS AND SURFACE RADEX



SHOT-TIME HODOGRAPH

FIG EVENT

181600M AUGUST